

ELEVENTH ANNUAL REPORT  
OF  
DIVISION OF WATERWAYS  
OF  
THE DEPARTMENT OF PURCHASES  
AND CONSTRUCTION

July 1, 1927  
TO  
June 30, 1928



LESLIE SMALL, Director  
WILLIAM F. MULVIHILL,  
Supervisor of Illinois Waterway Construction  
L. D. CORNISH, Chief Engineer

Chicago Office, 220 S. State St.





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## WATERWAYS.

WM. F. MULVIHILL,

*Supervisor Illinois Waterway Construction.*

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The Eleventh Annual Report of the Division of Waterways covers the principal activities of the Division from July 1, 1927, to June 30, 1928.

As was stated in the Tenth Annual Report, the Division of Waterways was transferred, July 1, 1925, from the Department of Public Works and Buildings, and became a part of the newly created Department of Purchases and Construction, of which Mr. Leslie Small was appointed Director. The present Supervisor of Waterway Construction was appointed as Superintendent of Waterways, September 2, 1925, and to his present position July 14, 1927, the title of the office having been changed by the Fifty-fifth General Assembly.

### JURISDICTION OF DEPARTMENT.

The law confers upon the Department the powers, duties and jurisdiction formerly exercised by the Rivers and Lakes Commission, with especial reference to its jurisdiction over all rivers and lakes of the State of Illinois, to prevent pollution thereof or encroachments thereon; the powers and duties of the Illinois Waterway Commission, with reference to the construction, operation and maintenance of the Illinois Waterway, and for the development and utilization of the water power thereof; and also the powers of the Illinois and Michigan Canal Commissioners, for the control and management of the Illinois and Michigan Canal, the maintenance of the navigability thereof and the sale and lease of canal lands and property.

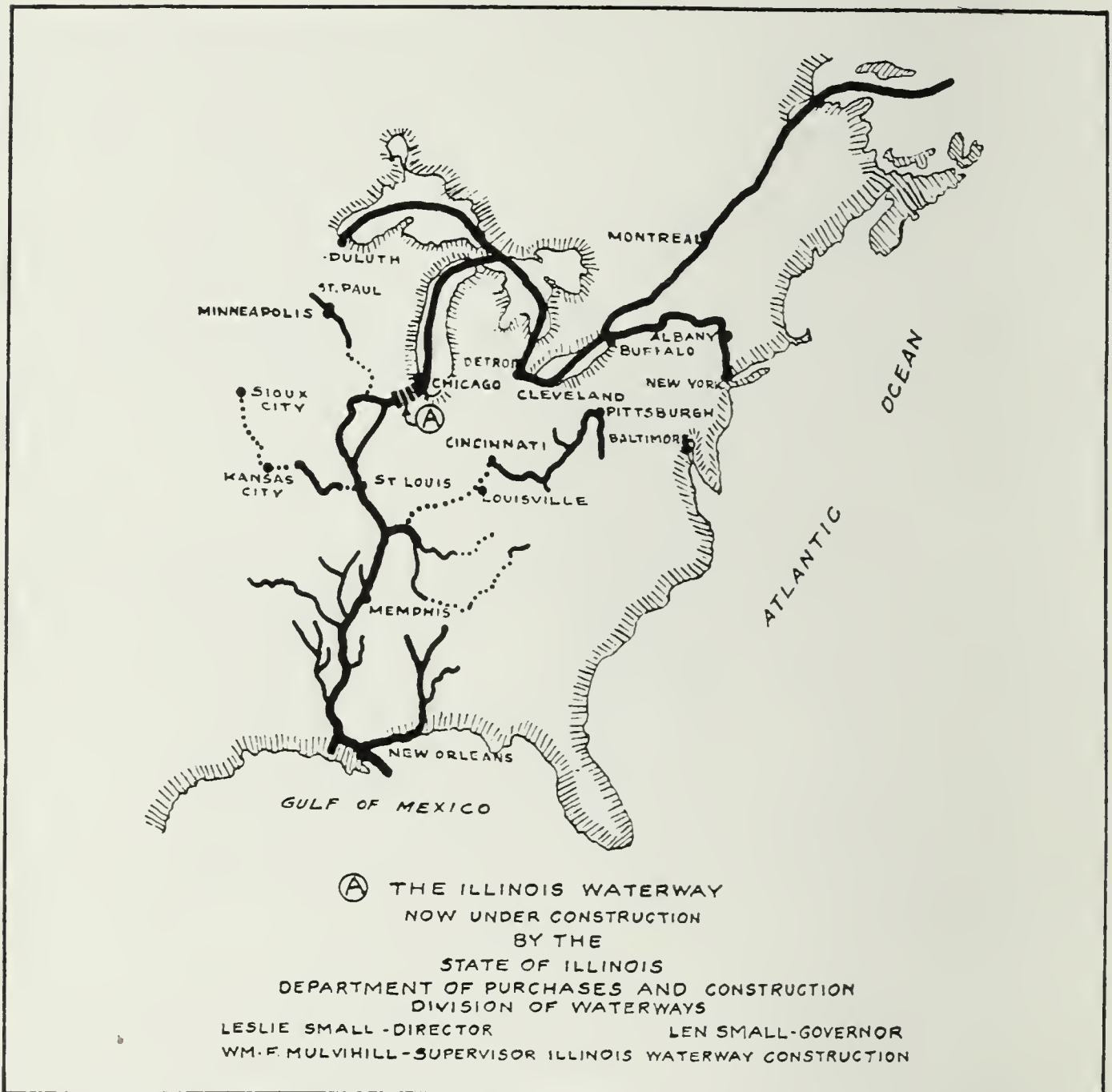
### A YEAR OF CONSTRUCTIVE ACHIEVEMENT.

The fiscal year ending June 30, 1928, witnessed the carrying forward of the greatest construction program in the history of the Division. The appropriations to the Division for the biennium, July 1, 1927, to June 30, 1929, amounted to \$19,253,813. This included \$16,674,500 for Illinois Waterway Construction; \$1,500,000 for Emergency Relief in Flood Areas, and a reappropriation of the unexpended balance of \$350,000 for protection of the city of Beardstown from overflow of the Illinois River. During the past year the expenditures have amounted to \$4,232,814, of which \$2,827,553 was for Waterway construction, \$822,345 for Emergency Flood Relief and \$349,138 for Beardstown Sea Wall and Levees. The expenditures for Flood Relief work, alone, exceeded by \$20,000 the largest previous expenditure of the Division for waterway purposes prior to 1927.



WATERWAY WORK STARTED AMOUNTS TO \$7,000,000.

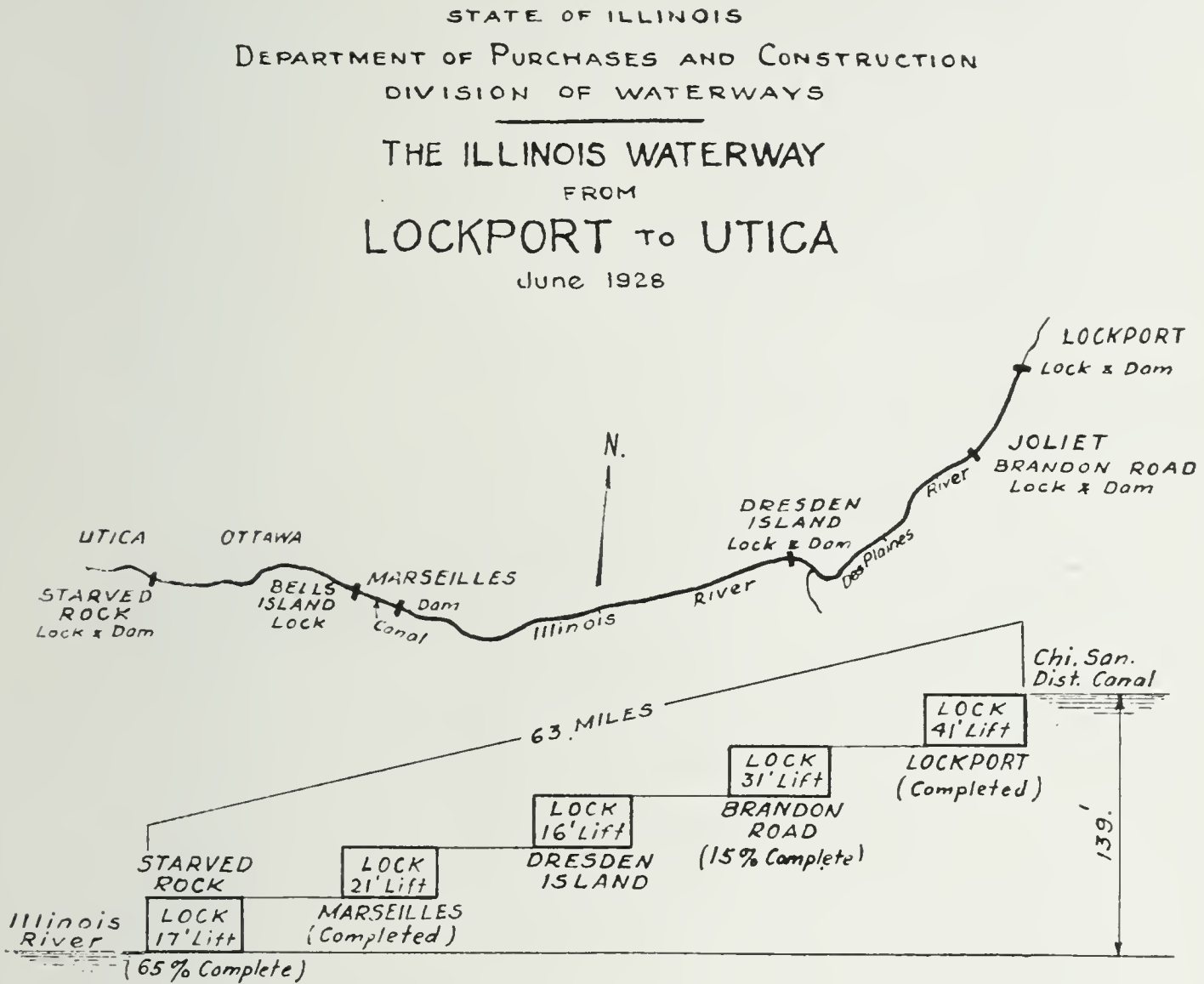
During the last fiscal year the total estimated cost of contracts awarded or work put under construction by the Division, excluding over \$900,000 paid for right-of-way, amounted to over \$6,936,000—which sum exceeds the total expenditures of the Division during the ten years of its previous history. The overhead or operating expense of the Division was



This map shows two great systems of inland waterways, the Great Lakes System and the Mississippi Valley System. "The Illinois Waterways," now being constructed by the State of Illinois at a cost of \$20,000,000 is the connecting link between these two systems. Its completion, fixed, for April 1, 1931, will afford a 9-foot navigable channel from Chicago to New Orleans.

at the same time proportionately decreased. The contracts let and construction work started during the past year include 100 emergency flood relief contracts, Beardstown sea wall and levee contracts, the construction by the Division itself of Brandon Road lock, dam and retaining walls of the Illinois Waterway and contracts for the lock gates and metal work of Starved Rock lock and dam.

Sealed proposals for excavating in Starved Rock Pool, Marseilles Canal, Dresden Island Pool and Brandon Road Pool will be opened July 18, 1928. Advertisements for lock gates for Brandon Road and Dresden Island projects and for operating machinery at all locks have been pre-



pared and it is expected proposals will be received within the next sixty days.

The following tabulation shows the "Expenditures from the Waterway Fund" since the creation thereof in 1920 to the end of the current fiscal year:

EXPENDITURES FROM THE ILLINOIS WATERWAY FUND FROM OCTOBER 19, 1920, TO JUNE 30, 1928.

Fiscal years ending June 30.	Total structures, including labor.	Total cement for structure.	Total salaries— wages, Chicago office.	Total salaries— wages, field.	Total office expense.	Total equipment and supplies.	Total land and property damage.	Total miscellaneous and incidental expense.	Total travel expenses.	Yearly total.
1921-----	\$ 182,752 49	-----	\$ 20,770 00	\$ 7,720 00	-----	-----	\$ 92,671 95	-----	-----	\$ 303,914 44
1922-----	430,896 93	-----	35,505 57	26,283 91	\$ 4,057 59	\$ 78 55	\$ 145 30	\$ 539 79	\$ 1,675 01	499,182 65
1923-----	604,502 59	-----	56,005 20	10,222 66	708 55	92 78	2,229 65	3,165 02	4,313 26	681,239 71
1924-----	170,833 02	-----	69,063 78	431 44	681 30	23 50	39,484 60	1,011 36	1,607 65	283,136 65
1925-----	311,521 78	-----	39,163 87	-----	1,711 56	-----	14,958 20	204 30	299 94	407,300 35
1926-----	585,813 30	\$ 39,440 70	44,427 38	3,259 40	699 91	414 81	37,808 80	5,810 13	3,272 27	802,585 40
1927-----	905,104 42	121,079 40	74,174 28	-----	761 75	349 77	-----	7,277 28	3,027 24	1,085,039 24
1928-----	1,580,539 55	94,344 50	122,555 02	-----	700 40	594 70	-----	28,758 34	6,027 18	2,827,553 59
Total to June 30, 1928	\$4,771,964 08	\$440,301 80	\$461,665 10	\$47,917 41	\$9,321 06	\$1,554 11	\$1,090,239 70	\$46,766 22	\$20,222 55	\$6,889,952 03



## EMERGENCY FLOOD RELIEF.

The Emergency Flood Relief Act (Senate Bill 576) approved July 7, 1927, appropriated \$1,500,000 to furnish emergency relief in the areas in Illinois, which by reason of the abnormal weather conditions of 1926-1927 had been submerged, or damaged by floods and for the repair and reinforcement of levees which had been or were in danger of being damaged by flood waters.

The carrying out of the provisions of this emergency flood relief law devolved upon the Division of Waterways. The magnitude of this task will be appreciated when it is remembered that the 1926 flood on the Sangamon and Illinois Rivers occurred during the crop season and exceeded all prior floods as to flood heights and damage to property, and that it continued for 42 days on the Sangamon and for 66 days on the Illinois.

The 1927 flood followed so close upon that of 1926 as to be almost a continuation of the same. It continued for 109 days on the Sangamon, 151 days on the Illinois and for 33 days on the Mississippi at East St. Louis and for 75 days at Cairo.

## WATER 15 FEET DEEP ON FARMS.

The depth of water on drainage and levee district land in some cases was as great as 15 feet. Some of the land was under water for a period of nearly two years owing to the inability of the owners to repair the levees. The principal areas flooded were farm lands which had been reclaimed by levees, and were very productive. In all, more than 400,000 acres of land in drainage districts were submerged, with a direct, traceable damage of more than \$18,000,000.

## DIVISION HANDLES 100 EMERGENCY RELIEF CONTRACTS.

Estimates for the rebuilding and strengthening of broken and damaged levees, made by engineers and trustees of the levee and drainage districts seeking emergency flood relief, placed the cost of the work to be done in excess of \$2,000,000. By thoroughly organizing its emergency flood relief work, it has been possible for the Division of Waterways to care for substantially the entire relief provided for by the law, at a total cost well within the appropriation of \$1,500,000 made by the General Assembly.

For the prosecution of this work it was necessary to organize an entirely new field force of engineers, surveyors and inspectors. Headquarters were located at Beardstown for the Illinois Valley Division, and at Anna for the Mississippi Valley work. A total of 100 separate contracts were awarded, aggregating \$912,313. Other contracts are being negotiated.

## SAVING BEARDSTOWN FROM FUTURE FLOODS.

The city of Beardstown is on the east bank of the Illinois River about 70 miles below Peoria and about 90 miles from Grafton, where the Illinois discharges its waters into the Mississippi. The land on which the city is built was originally several feet above ordinary high water stages of the river, but, owing in part at least to the extensive

construction of levees for reclamation of lands in the river bottoms which reduced the flood flow sections of the river, and due in part, as is claimed by many local residents, to the diversion into the Illinois Valley of water from Lake Michigan by the Sanitary District of Chicago and to the effect of the Government dams at Kampsville and LaGrange, the flood stages in recent years have risen to such height that the city has been almost completely inundated four times since 1922.

#### GENERAL ASSEMBLY APPROPRIATED \$350,000.

Presumably because the levee and drainage districts have been created under authority of law, and since no one district could be held responsible for the lessening of the natural overflow areas, and, also, because its limited bonding power made it impossible for the city to protect itself from overflow of the Illinois River, the General Assembly in 1923 appropriated \$350,000 for Beardstown flood protection. This sum lacked \$46,000 of being sufficient to build adequate walls and levees, according to estimates made by engineers for the Division of Waterways, and therefore no contract could be let. This \$350,000 was reappropriated in 1925. In 1927, the Chicago, Burlington and Quincy and the Baltimore and Ohio railroads having arranged to supply the needed \$46,000 additional funds, plans and specifications were drawn and bids received prior to the adjournment of the Fifty-fifth General Assembly, June 30, 1927. Contracts were awarded to the low bidders, James O. Heyworth, Inc., for the concrete wall and to McWilliams Dredging Company for the earth levees, as soon as the reappropriation bill had been approved.

A right-of-way committee of the Beardstown Chamber of Commerce, at a cost of \$22,976, secured 110 separate pieces of property on which to construct the wall and levees, condemnation proceedings being necessary in eleven cases.

#### WILL PROTECT CITY AGAINST 30-FOOT FLOOD STAGE.

The concrete wall along the river front is over 3,000 feet in length. From Clay to Jackson streets the wall rests on more than 2,000 wood piles driven in the earth 20 feet and projecting 5 feet into the concrete, locking it firmly. That portion of the wall resting on piling is 22 feet high with a 10-foot 3-inch base tapering to a 2-foot top. The entire wall will protect the city from a flood stage of 27.75 feet. The top is equipped so that an additional 2 feet of flash boards may be quickly put in place.

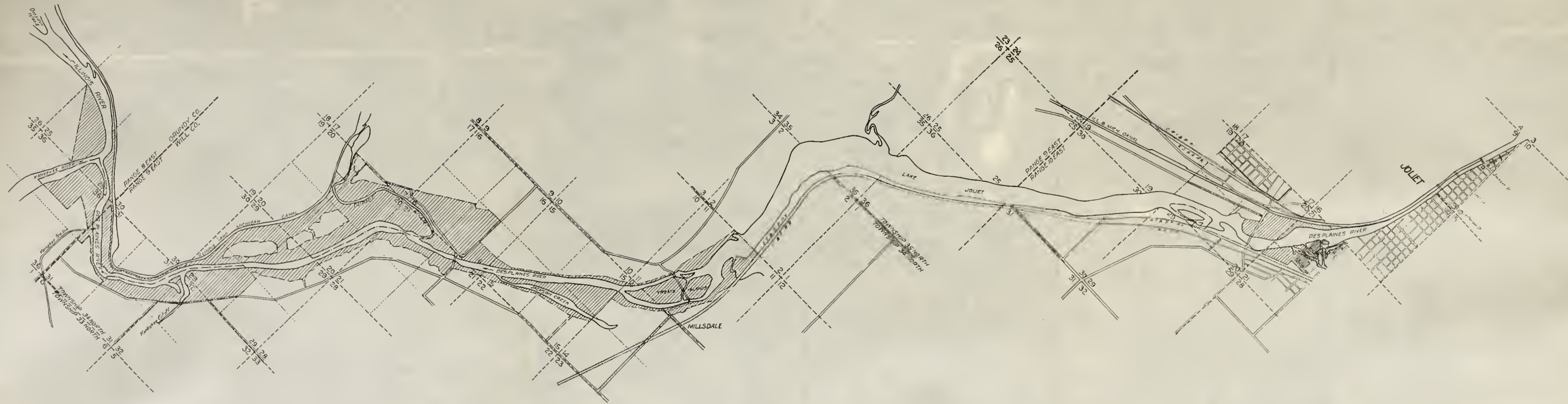
Connecting with the ends of the concrete wall are earth levees about two miles long protecting against a 31.75 foot flood stage. These levees are 10 feet wide at the top with a three to one slope. More than 500,000 cubic yards of earth was required to build the levees.

The space enclosed by the protective works, being much larger than the city itself, the entire area has been organized into a Sanitary District, the people residing in the territory voting bonds in the amount of \$200,000 to raise money for storm sewers and pumping plants which it was necessary to build to care for the rain and seepage water during high water periods. The entire work was completed during the fiscal year.







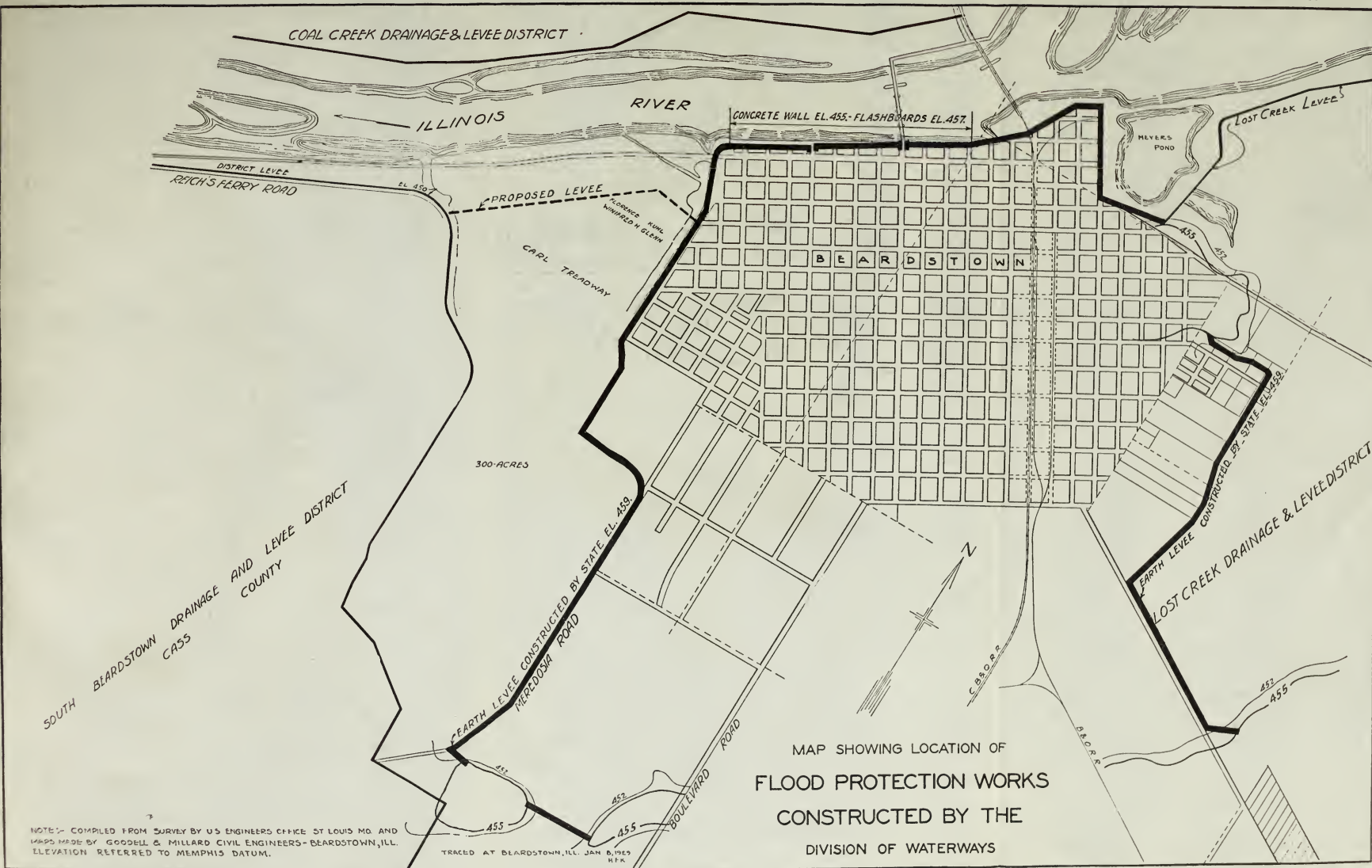


Shaded portions indicate lands acquired by the State from the Public Service Company of Northern Illinois, lying between Joliet and Dresden Island. When the Dresden Island Lock and Dam of the Illinois Waterway are completed and water levels are raised, this land will be submerged.

DIVISION OF WATERWAYS  
CONSTRUCTED BY THE  
FLOOD PROTECTION WORKS  
MAP SHOWING LOCATION OF









## STATE BUYS PUBLIC SERVICE COMPANY'S LAND.

Next in chronological importance, was the successful termination of negotiations with the Public Service Company of Northern Illinois, which owned substantially 1,877 acres of land on the DesPlaines River, extending from Brandon Road, which is about two miles below the city of Joliet, down to Dresden Heights, where the Kankakee River unites with the DesPlaines to form the Illinois River. The settlement agreement was signed September 15, 1927.

## SECURES IMPORTANT LOCK SITE.

This land included the site of the State's lock and dam at Brandon Road, now under construction, as well as lands which will be submerged by the building of the proposed lock and dam at Dresden Island. It was formerly owned by the Economy Light & Power Company, which was for eight years involved in litigation with the State over the question of its right to construct a power dam in the DesPlaines River near the site of the proposed State dam at Dresden Island.

Appraisers for the Public Service Company had placed a value to the company of over \$4,000,000 on this property and a sale value in excess of \$2,000,000 to any purchaser not having the same facilities for distribution of electrical energy.

## ALSO GETS 247 ACRES AT MARSEILLES.

The Marseilles Hydraulic Company, a subsidiary of the Public Service Company, also had a 99 year lease on 247 acres of land on the south side of the Illinois River at Marseilles which it was necessary for the State to acquire. The Public Service Company submitted a proposal to the State to sell the Brandon Road and Dresden Heights property and transfer the leasehold of the Marseilles property for \$1,100,000. This offer was made because of the industrial and commercial benefits which will result from the completion of the waterway.

## CONDEMNATION SUIT PROTECTED MINORS.

The price finally agreed upon was \$975,000, but, owing to the fact that the rights of minor heirs of the original lessee of the Marseilles property were involved, a friendly condemnation suit was filed to determine the rights of all parties. The fee title to all the property was thus secured by the State for substantially the same price as originally agreed upon, plus the value of the residuary estate.

The total property acquired by this transaction amounted to 2,124 acres, and involved the examination of 48 separate abstracts of title. It opened the way for starting, in November, 1927, the Brandon Road Pool construction, the largest and most difficult part of the entire Illinois Waterway project.

## STATE ITS OWN CONTRACTOR.

Probably the most interesting and certainly the most important and difficult task in connection with the entire Illinois Waterway project is presented by the Brandon Road Pool construction which includes not only the building of the lock and dam, two miles below the city of Joliet,

but also the construction of about four and one-half miles of concrete retaining walls, extending upstream from the dam. The river bed is of rock formation and there is a very rapid current. Because of the water hazards involved, the Division of Waterways has undertaken the construction of this project by the direct employment of labor, materials and equipment and is prosecuting the work with such success that it is probable the Dresden Island project will be handled in the same manner, as a means of expediting the completion of the waterway and at the same time reducing the total cost of construction.

In October, 1927, an arrangement was made with Green and Sons Company, Engineers and Contractors of Chicago, to act as superintendents of labor and construction of this work for the Division on a fee basis. The amount of the fee to be inversely proportional to the cost of construction. In other words, the lower the cost the greater the fee, thus putting a premium upon economy and efficiency.

#### GOVERNOR SMALL BREAKS GROUND FOR LOCKS.

"Chicago Commerce," official organ of the Chicago Association of Commerce, in its issue of November 26, 1927, prints the following report of an Illinois Waterway inspection trip participated in by representatives of the commercial and industrial interests of the State in conjunction with the actual breaking of ground for the Brandon Road Lock:

#### "WILL OPEN BARGE CANAL IN THREE YEARS.

"Governor Len Small officially started work on Brandon Lock, one of the last steps in completing the Lakes-to-Gulf Waterway, on the Illinois Waterway inspection trip made Friday, November 18, by members of the Chicago Association of Commerce, the Illinois Chamber of Commerce, the Mississippi Valley Association and the Illinois Manufacturers' Association. Officials making this trip expressed their belief that the waterway would be open to traffic in less than three years.

"William R. Dawes, President of The Chicago Association of Commerce, headed the delegation of more than seventy men which started from Chicago at 9 a. m. in a special Santa Fe train, meeting the Governor at Joliet at 10 a. m.

"The trip was favored by having a bright sun to offset the coolness and warm cars provided by the Santa Fe, Illinois Traction System and the Rock Island made it most comfortable. The snow which fell that day in Chicago had hardly touched the route which was followed. Excellent meals served by the Joliet Chamber of Commerce and on the Rock Island diner added to the pleasure of those making the trip.

#### SUPERVISOR OF CONSTRUCTION TALKS.

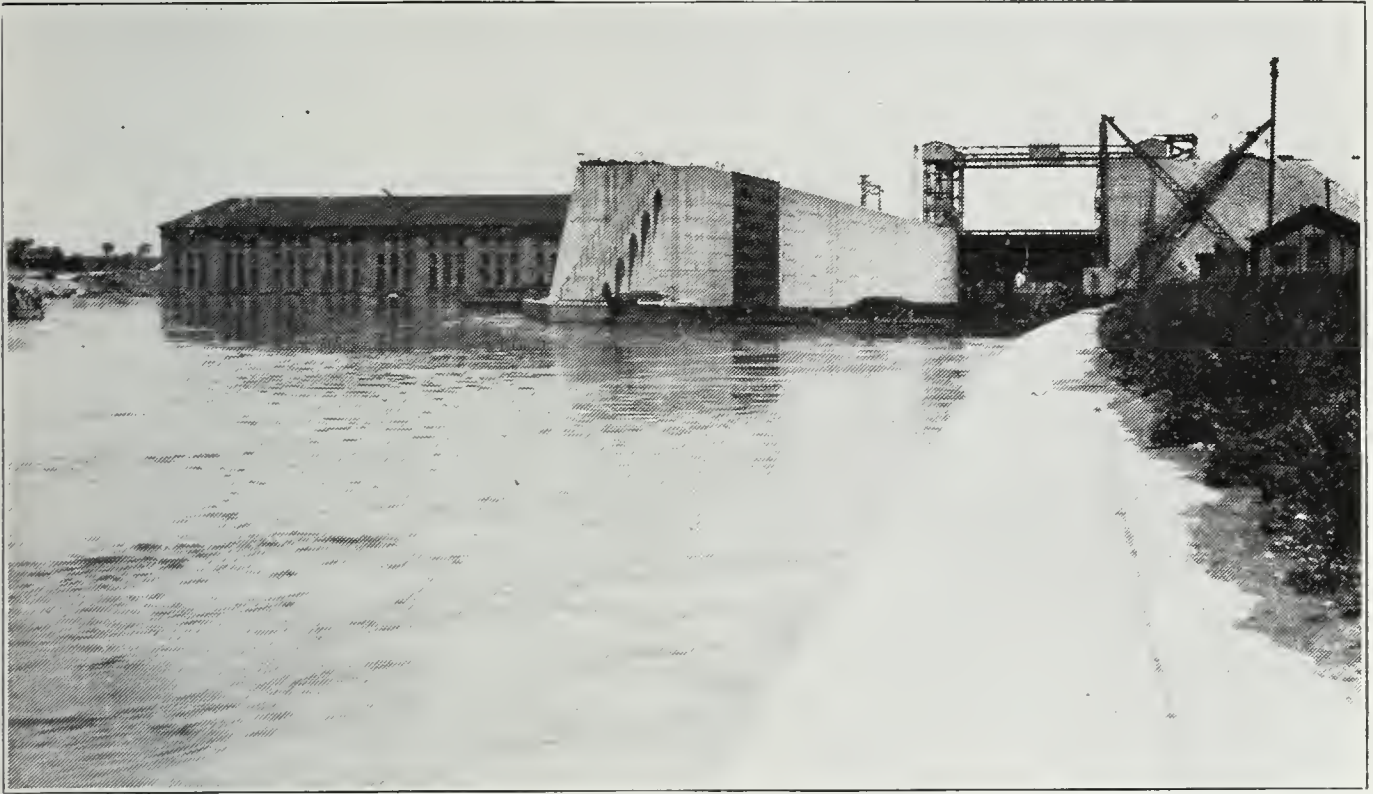
"From Joliet the group, which numbered about seventy-five shippers and others interested in improved transportation, went back to the Lockport lock and power plant. A half hour was spent in inspecting this lock, William F. Mulvihill, Superintendent of the State Division of Waterways, explaining its operation and its part in the waterways plan. He said in part:

"The Illinois waterway consists of a series of locks and dams between Lockport and Utica, a distance of about 63 miles. This lock is located at the end of the main channel of the Chicago Sanitary District Canal about 35 miles from Lake Michigan. It is practically completed and is identical in horizontal dimensions with the other locks of the series, having a width of 110 feet and a usable length of 600 feet. It has a lift of 41 feet and is equipped at the upper end with two sets of gates of the lift type, weighing 200 tons each.



“The gates at the lower end of the lock are of the swinging type. Each gate being 55 feet wide and 63 feet high. They weigh 315 tons each. These gates, which are operated by electricity, are the highest lock gates in the world and when open fold back into the side of the lock. The lock can be filled and emptied in from 8 to 10 minutes and is large enough to permit locking through a fleet of barges carrying 9,000 tons of freight at a single lockage.’

“After inspecting this lock the party again boarded the train and returned to Joliet for luncheon at the Joliet Chamber of Commerce. At the station the Joliet High School band, twice champions of the United States, met them and preceded them in an impromptu parade to the local chamber building, the Governor thanking the band for its greeting in a short speech.



Lockport Lock of the Illinois Waterway, looking upstream.

In addition to the Chicago group more than 500 Joliet men and women attended the noon meal. Senator Richard J. Barr presided and introduced the speakers.

#### GOVERNOR SMALL SPEAKS.

“Thanking the people of Illinois for having made possible the waterways development, which has been sought since 1908, Governor Small said, following the luncheon:

“It is a great pleasure for me to meet this group of our visitors, business men from Chicago and other parts of the State of Illinois. Your deep and abiding interest in the early completion of the Illinois Waterway and in the opening of navigation from Lake Michigan to the Gulf of Mexico is demonstrated by this and former waterway inspection trips in which you have taken part.

“Permit me to thank you for your many kind words of appreciation of my efforts as Governor in pushing the waterway construction work to completion as rapidly as possible, so that the dreams of former generations may become the realities of the near future, to the mutual benefit of ourselves, and our neighbors of the Mississippi Valley.

“The people of Illinois in 1908, nineteen years ago, by overwhelming vote, authorized the issuance of \$20,000,000 of waterway bonds to improve the DesPlaines and Illinois Rivers and to connect the Chicago Sanitary and Ship Canal at Lockport with the navigable waters of the Illinois River near Utica; but it was not until 1919 that the present Waterway Act was passed and although one contract was let just prior to my taking office, it is a



matter of fact that all of the actual work of construction has been accomplished under my administration. The early work was hampered and delayed by litigation and by negotiations over questions of water power and right-of-way. Fortunately, these troubles are now largely behind us.

“The inspection today of the practically completed Lockport job has made you acquainted with the size of the locks; all of which are of the same dimensions, except in the matter of their height or lift. Before the day is over, you will have visited the Marseilles Lock, which also is practically completed, and the Starved Rock job, which is about sixty-five per cent finished.

“This afternoon we start the work of excavation for the Brandon Road Lock, and I trust that within a very short time we shall be able to announce the beginning of work at Dresden Island, just below the juncture of the Kankakee and DesPlaines Rivers, which unite to form the Illinois, this being the site of the last lock and dam needed to carry the entire Illinois Water-



Excavating for side walls of Brandon Road Lock, near Joliet.

way project to completion. I assure you that I shall push this work with all possible vigor.’

“President Dawes speaking before the Governor, told the purpose of the day’s trip. He complimented the Governor on the progress which has been made under the latter’s administration and assured him of the heartiest cooperation in the work still to be done in giving Illinois a new outlet to the sea.

#### DOCKS ARE NEEDED.

“John H. Camlin, President of the Illinois Chamber of Commerce, stressed the necessity of cities along the waterway looking ahead and planning for the most effective use of the project when it is finished. He pointed out that, without dockage and efficient loading and unloading machinery, the expected saving in freight rates would not be made and the hoped for industrial development along the barge route would not take place.

“The promise was made by Congressman William E. Hull of Peoria, that the next session of Congress would appropriate the funds needed to complete the dredging of the Illinois River below the last lock at Starved Rock.



"Mayor Fred Sehring of Joliet expressed that city's approval of the waterways construction to date and assured the Governor of Joliet's co-operation in completing the task.

"After the luncheon, the party from Chicago boarded two special cars of the Illinois Traction System and proceeded to Brandon Road, two miles below Joliet. Here thousands of people had gathered to witness the turning of the first earth on the lock project there.

"Governor Small used a modern steam shovel rather than the old-fashioned spade for the ceremony, pulling the necessary levers amid the cheers of the large crowd. President Dawes, Mr. Mulvihill and Leslie Small also took part in this ceremony. A bit of humor was introduced into the scene when the Governor was paid by check for his labors.

"The site for this lock was recently acquired from the Public Service Company of Northern Illinois.

#### MULVIHILL TELLS ABOUT MARSEILLES LOCK.

"Due to shortness of time and almost impassable mud the lock near Marseilles, which is almost completed, was not visited. This lock and the one not yet started at Dresden Island, about fifteen miles down stream, were described by Mr. Mulvihill as follows:

"The fourth lock is about three miles below the city of Marseilles. It is completed except for the installation of machinery to operate the lock gates. It is expected that the dam already installed at Marseilles will be raised and a canal, constructed alongside the river, will connect the two.

"The third lock and dam will be at Dresden Island about 15 miles downstream from the Brandon Road Lock and just below the place where the Kankakee and DesPlaines Rivers unite to form the Illinois. The site for this was recently acquired from Wm. L. Wainwright and wife.

"The fifth and last lock in the chain connecting the Great Lakes with the Mississippi system of rivers was the last one on the itinerary of the party. This lock and dam project is about 65 per cent completed. According to Mr. Mulvihill the five locks will provide a combined lift of 126 feet, which, allowing for a 14-foot slope downstream, will equal the 140-foot fall between the Sanitary District Canal and Starved Rock.

"After inspecting this lock, the party returned to Ottawa by Illinois Traction. Dinner was served on the Rock Island train which carried the group from that city back to Chicago.

#### PERSONNEL OF PARTY.

"Included in the group making the trip were the following men from Chicago and other parts of the State:

"Governor Len Small, Springfield, Ill.; William F. Mulvihill, Supt. Division of Waterways, State of Illinois, Chicago; William R. Dawes, President The Chicago Association of Commerce; Anderson, S. T., Alward-Anderson-Southard Co., Chicago; Andrews, O. F., Special Representative, Chicago Association of Commerce; Appel, J. H., President Illinois Bankers Association, Highland Park, Ill.; Barr, Richard J., Joliet, Ill. (Waterways Committee, Illinois Chamber of Commerce); Baum, H. A., Safety Electric Company, Chicago; Blocker, A. L., Secretary, South Chicago Chamber of Commerce; Burke, Frank, Waukegan, Ill., Illinois Chamber of Commerce; Camlin, John H., President, Illinois Chamber of Commerce, Rockford; Colburn, D. S., Marquette Cement Mfg. Co., Chicago; Cook, LeRoy, Real Estate, Chicago; Cunningham, J. D., President, Republic Flow Meters Co., Chicago; Dumond, L. A., Manager, Industrial Department, The Chicago Association of Commerce; Ferris, C. G., General Secretary, Illinois Chamber of Commerce; Gardner, H. C., Gardner & Lindberg, Engrs. (Chairman, Harbors and Waterways Committee, The Chicago Association of Commerce); Haenisch, Herman, Consumers Company, Chicago; Harris, E. T., Payson Mfg. Co. (Chairman Waterways Committee, Illinois Manufacturers' Association).

"Haynes, J. P., Traffic Director, Chicago Association of Commerce; Hess, Franklin, Gen. Atty., International Harvester Company, Chicago; Hooker, John P., President, Chicago Real Estate Board; Hudson, J. H., Secretary,



Retail Interest Department, Illinois Chamber of Commerce; Hull, Wm. E., Peoria, Ill.; Judd, C. W., Acting Business Manager, The Chicago Association of Commerce; Lyford, H. B., Vice Pres., Hibbard Spencer Bartlett & Co.; McLeay, Lachlan, Secretary, Mississippi Valley Association, Chicago; Marsh A. Fletcher, Marsh & Truman Lumber, Chicago; Miller, H. F., Manager, Interstate and Foreign Commerce Committee, Chicago Association of Commerce; Moisant, S. E., Kankakee, Ill., Illinois Chamber of Commerce; Newspaper Representatives of: Associated Press, Chicago American, Chicago Daily Journal, Chicago Daily News, Chicago Herald-Examiner, Chicago Journal of Commerce, International News, Chicago Evening Post, Chicago Tribune, United Press; Pirie, John T., Carson, Pirie, Scott & Co. (Chairman, Transportation Committee, The Chicago Association of Commerce); Putnam, Maj. Rufus W., Chief Engineer, The Harbor Plan of Chicago; Sankey, John E., Joliet Gravel Co., Joliet, Ill.; Schlake, William, President, Illinois Brick Company, Chicago.

"Smith, Sidney A., Currier-Lee Warehouse Co.; Stephens, George, Editor, Illinois Journal of Commerce, Chicago; Taylor, Eugene S., Manager, Chicago Plan Commission; Thorp, H. W., President, Goodrich Transit Co., Chicago; Wait, Clarence A., Decatur, Ill., Illinois Chamber of Commerce; Williams, Walter, Benton, Ill., (Chairman Waterway Committee, Illinois Chamber of Commerce); Pirie, John F., Jr., Carson, Pirie, Scott & Co.; Charlette, Geo. B., Carson, Pirie, Scott & Co.; Thain, R. J., Carson, Pirie, Scott & Co.; Graham, C. E., A. T. & S. F.; Minchin, G. H., A. T. & S. F. R. R.; Moriarty, J. R., A. T. & S. F. R. R.; Pixley, H. D., Carson, Pirie, Scott & Co.; Stadill, C. W., Carson, Pirie, Scott & Co.; Livingston, Charles A., the Illinois Manufacturers' Association; Westman, Edw. C., the Illinois Manufacturers' Association; Brent, Theodore, New Orleans; Lynde, Cornelius, Chairman, Miscellaneous Solicitations Committee; Eberhard, Fred U.; Cornish, L. D., Asst. Chief Engineer, State Division of Waterways; Miller, J. N., Illinois Rivers Division of Mississippi Valley Association; Webster, James, New York Central lines; Jacobson, R. A., Rock Island Plow Co.; Luth, L. E., Association of Commerce, Winona, Minn.; Mueller, Herman, St. Paul Association."

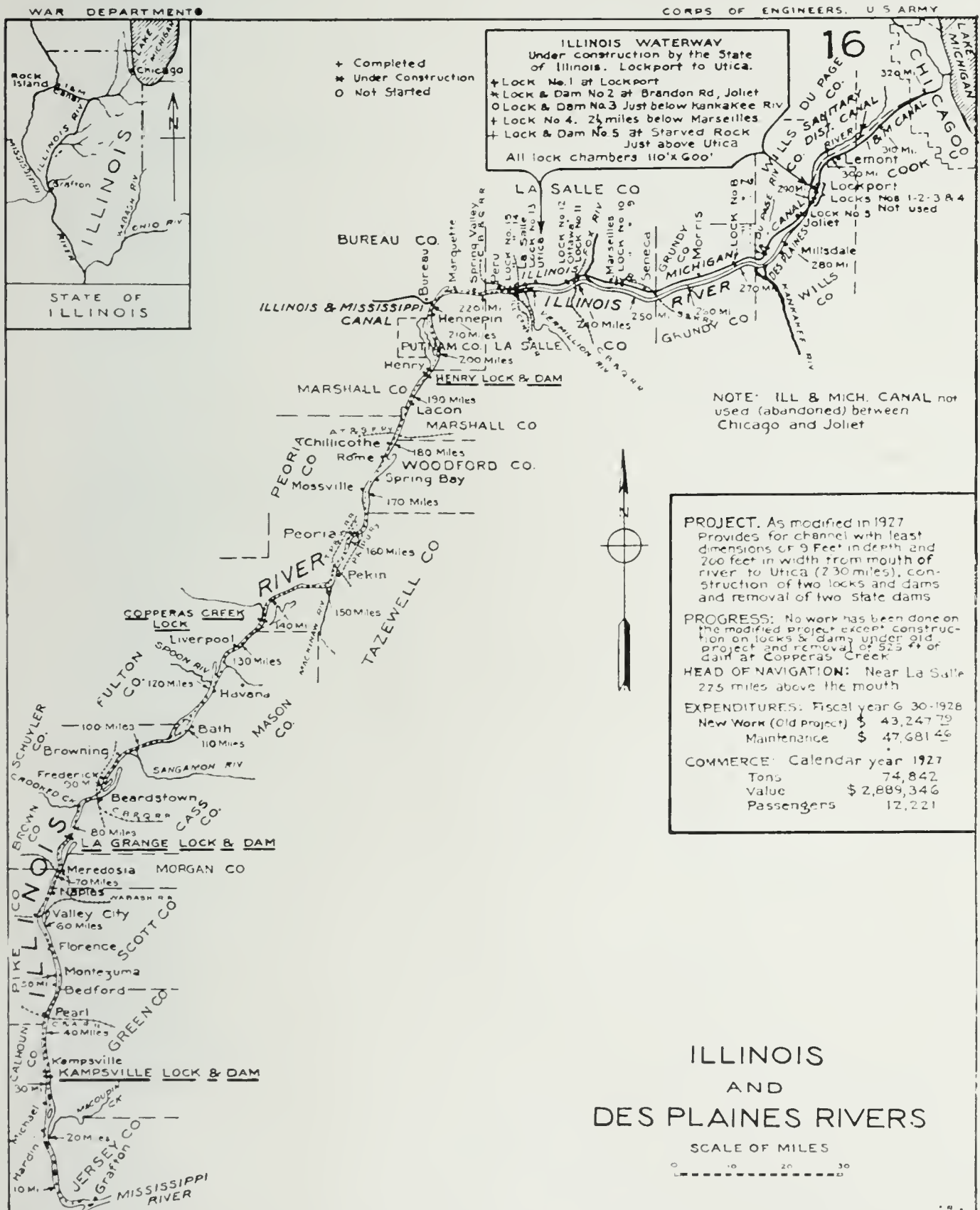
In addition to the foregoing literally thousands of people assembled at Brandon Road Lock site to witness the ceremony of breaking ground for this most important project of the Lakes-to-the-Gulf Waterway.

## IMPROVEMENT OF LOWER ILLINOIS RIVER.

In accordance with the Act of Congress of January 21, 1927, the Federal government modified the project depth of the Illinois River so as to increase the depth of channel from 7 to 9 feet with a minimum width of 200 feet from the mouth of the river at Grafton to connect with the Illinois Waterway at Utica, a distance of about 225 miles. This Act also provided for transfer by the State of Illinois to the Federal government of the two State-owned locks and dams in the Illinois River and the removal by the Federal government of said dams. In compliance with this Act of Congress and under authority of an Act of the General Assembly of the State of Illinois approved June 21, 1919, entitled, "An Act authorizing the dams, works and appurtenances at Henry and Copperas Creek to be granted to the United States," the Department of Purchases and Construction formally conveyed to the Federal government the dams, works and appurtenances referred to, possession being surrendered at the end of the fiscal year.

## STATE-OWNED DAMS TO BE REMOVED.

The locks and dams in the Illinois River at Henry and Copperas Creek were constructed by the State of Illinois in 1871 and 1877, respectively. The locks are 73 feet wide and 325 feet usable length, the Henry dam being 541 feet long and the Copperas Creek dam 640 feet



The connecting link for navigation between Lake Michigan and the Mississippi River.

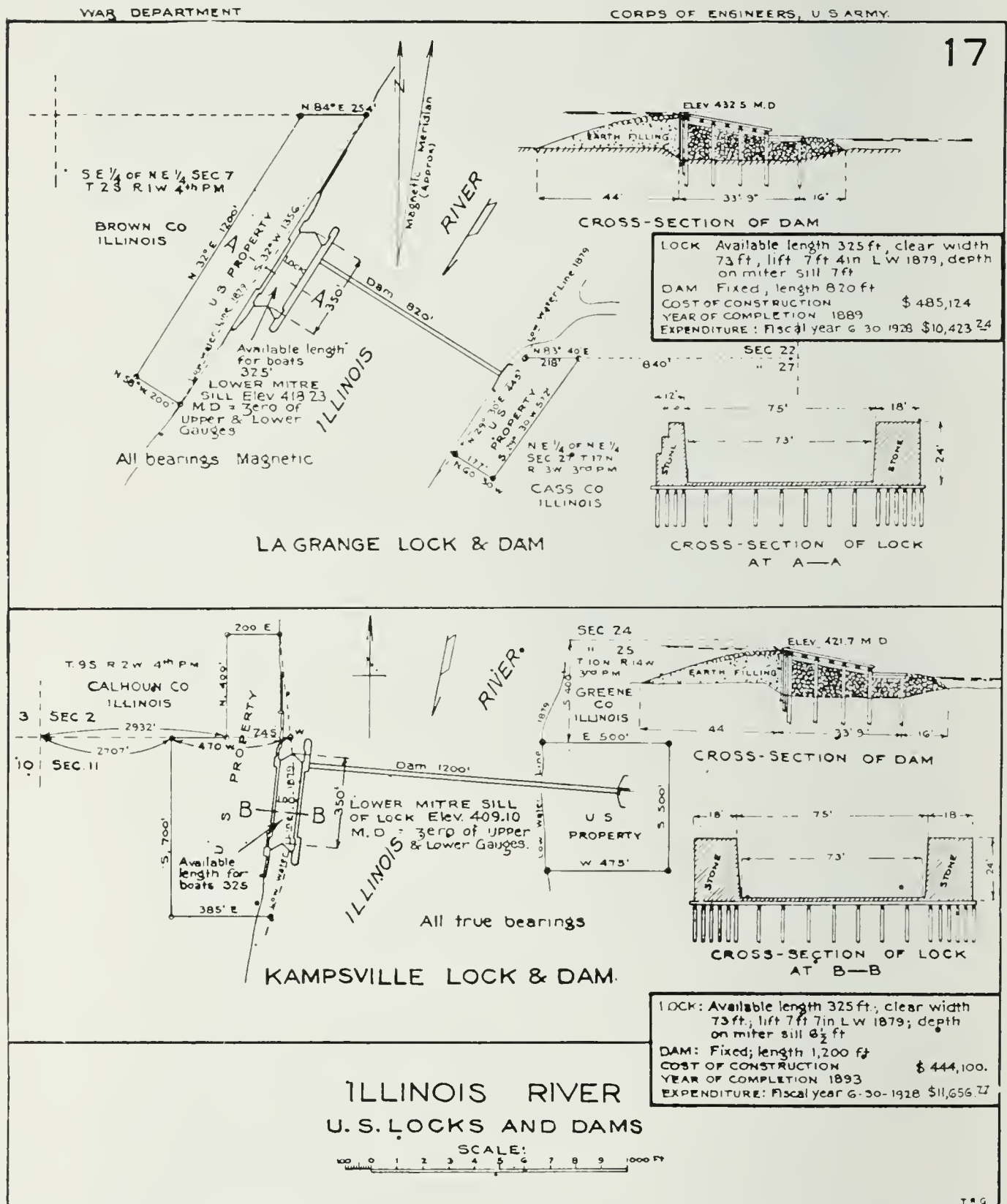
in length. Both of these dams are to be removed in the interest of navigation.

Two other dams in the lower Illinois, one located at LaGrange, 820 feet long, 80 miles from the Mississippi, and the other at Kampsville,



1,200 feet long, 30 miles from the mouth of the Illinois, were completed in 1889 and 1893, respectively. The locks are the same dimensions as at Henry and Copperas Creek.

As all the lock chambers of the Illinois Waterway are 110 feet wide by 600 feet usable length it is hoped that the Federal government will



These Federal Locks and Dams in the Illinois River, are to be retained for the present but may be removed or changed later.

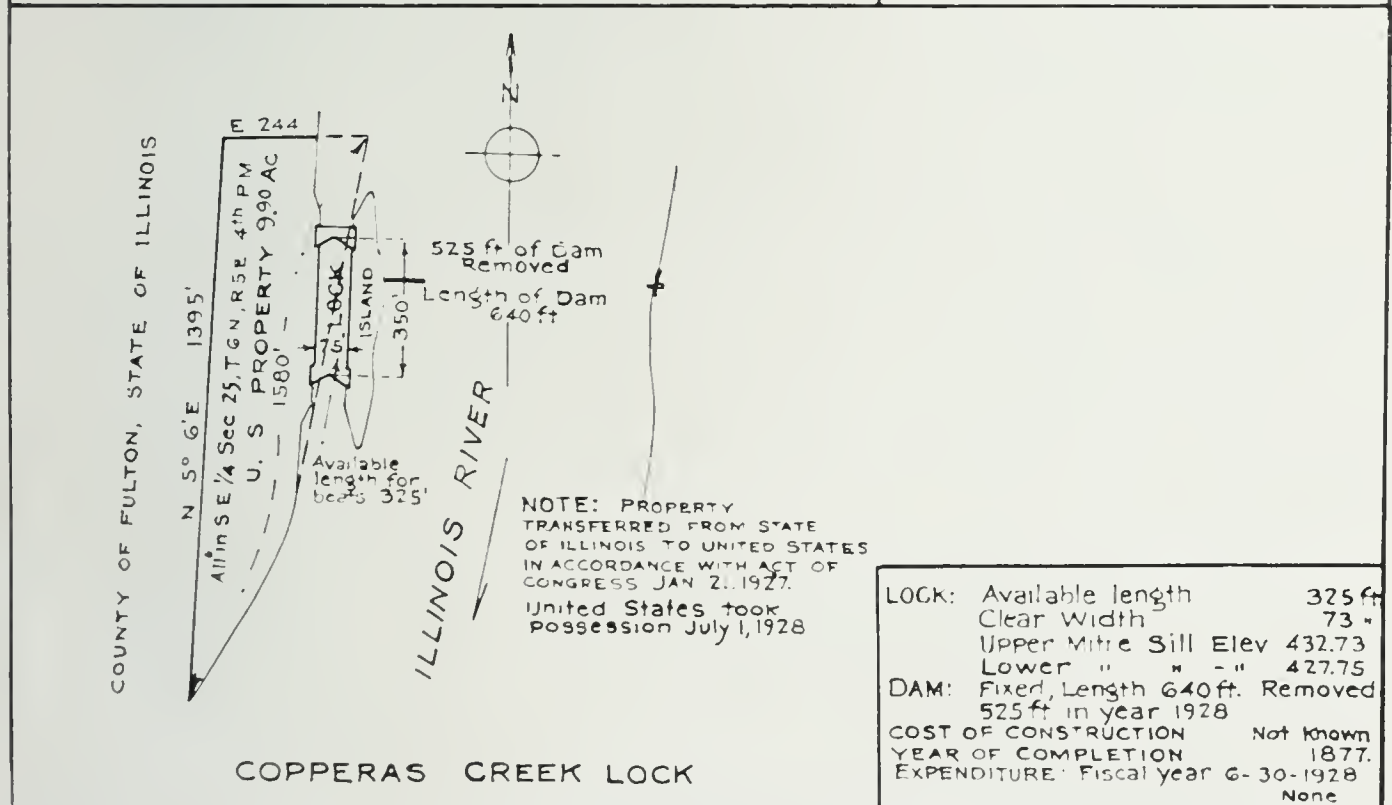
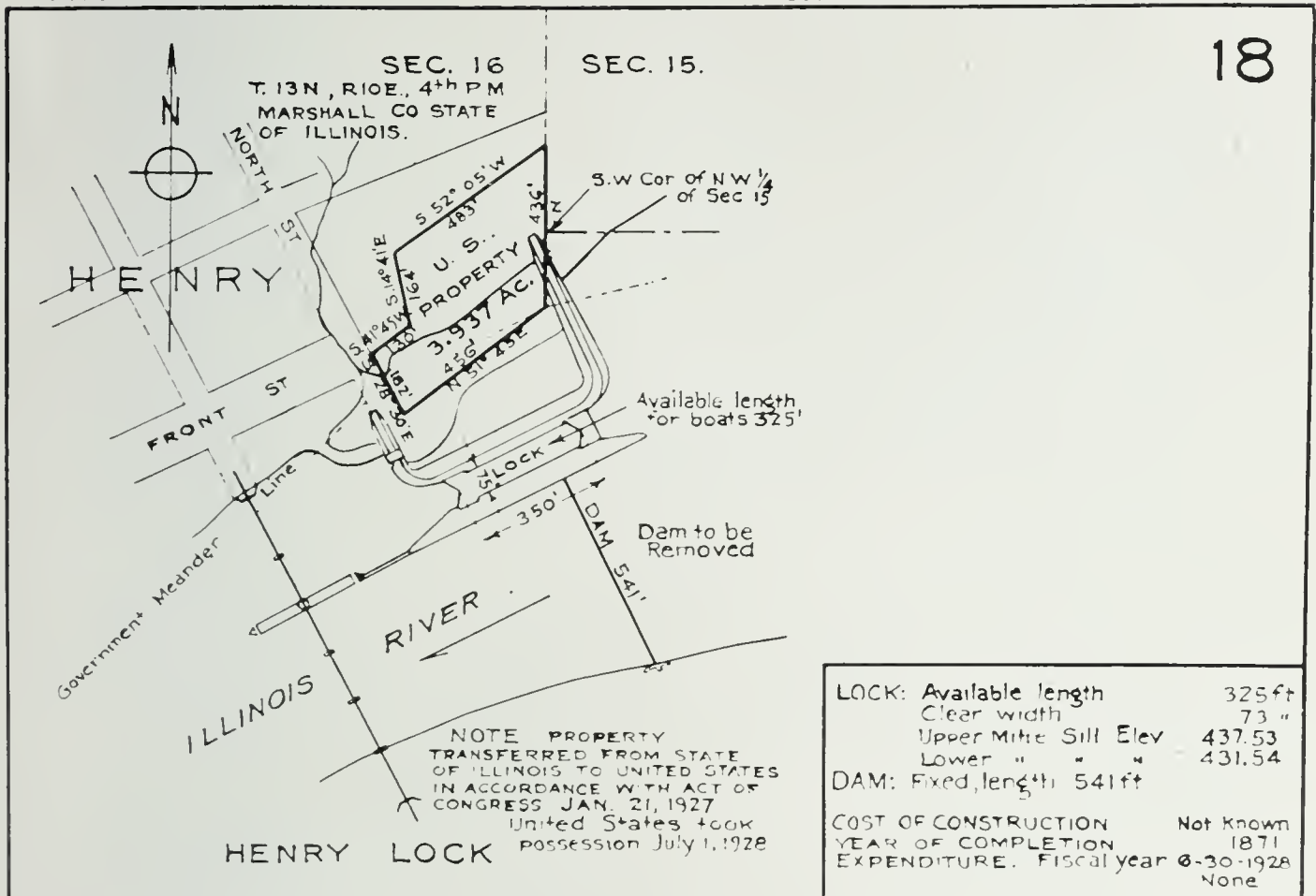
not only remove the Henry and Copperas Creek dams but will also remove or modify the LaGrange and Kampsville dams so as to provide open river navigation from the end of the Illinois Waterway to the Mississippi River, a distance of 225 miles, with a total fall of only 28 feet or about one inch to the mile.



WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY.

18



## ILLINOIS RIVER

## U. S. LOCKS

SCALE:

100 0 1 2 3 4 5 6 7 8 9 1000 Ft

TRG

These Locks and Dams were turned over to the United States by the State. The Dams have been or will soon be removed.

## FLOOD CONTROL A NATIONAL PROBLEM.

GOV. LEN SMALL IN WASHINGTON URGES FEDERAL ACTION.

On November 7, 1927, Governor Len Small, accompanied by the Director of the Department of Purchases and Construction, the Supervisor of Illinois Waterway Construction, and by other public officials of the State and representatives of important industries and interests affected by flood conditions in the valleys of the Illinois and Mississippi Rivers, appeared in his official capacity before the Flood Control Committee of the House of Representatives of the United States, at the National Capitol in Washington, for the purpose of urging that an adequate flood protection program for the Mississippi River and its tributaries be provided by the Federal government.

In addressing the Flood Control Committee Governor Small, among other things, said:

"The people of the State of Illinois feel that flood conditions in our State, and in the Mississippi Valley below us, this last year, were of such wide scope and devastating nature as to call for immediate action by Congress looking to the prevention of any recurrence of similar disasters in the future. This, we feel, can be assured only by a broad system of flood control, satisfactory alike to the Federal government, the states and the people of the flood areas.

"The people of Illinois, whom I have the honor to represent as Governor, respectfully petition your committee, and through you the Congress of the United States, for the prompt preparation and enactment of laws adequate for the permanent protection of their homes and property against the recurring menace of flood waters which create conditions beyond the control of the State or of the communities affected.

## FLOOD CONTROL PROBLEM IS NOT NEW.

"The problem of flood control is not new. From time to time for the past 50 years, at least, it has been the subject of discussion in the halls of Congress and for about 40 years the Mississippi River Commission, as an agency of the Federal Government, has been dealing with this problem in the Mississippi Valley. But the fact that no adequate solution of the problem has yet been provided is established by the devastating calamity of the present year, which again makes this subject of such major importance as to demand immediate consideration and early action by the Congress of the United States.

"Under these circumstances, I congratulate the members of this committee upon their opportunity to perform a constructive public service and I also congratulate the people of the United States, and particularly the residents of the stricken areas, upon the deep and intelligent interest you have shown. We thank you, gentlemen, for the timely and careful consideration being given by you to this most important subject, and sincerely trust that such facts and figures may be presented, and such methods and measures may be prepared, as will permit prompt and intelligent action to be taken by the Congress which will meet next month.

## ILLINOIS IS IN MISSISSIPPI FLOOD AREA.

"The Mississippi drainage area equals 40 per cent of the territory of continental United States, and the waters of nearly one-half the States find their way to the sea through the valley of the Father of Waters.

"The State of Illinois is river-washed. It is largely bounded on the east and south by the Wabash and Ohio Rivers, and on the west by the mighty Mississippi. It is diagonally bisected by the DesPlaines and Illinois, which within the next three years—when present projected improvements are completed—will provide the connecting link in the Lakes-to-

the-Gulf-Deep-Waterway. These boundary and bisecting rivers, are all sizable streams—navigable waters of the United States—and tributaries of the Mississippi. The flood conditions of the Mississippi Valley are of great importance to the people of the State of Illinois.



Where the Illinois and Mississippi Rivers overflow onto thousands of the most fertile acres in the world. The shaded portions are the areas which were submerged during the floods of 1922, 1926 and 1927. Detailed reports show that total losses in excess of \$30,000,000 were inflicted during the six-year period covered by these flood times. Thousands were driven from their homes, merchandise was ruined and hundreds of thousands of acres of farm lands were covered with water for months at a time.

“At the present time the jurisdiction of the National government, in the matter of flood control, is represented by the Mississippi River Commission, and is limited to the Mississippi River itself, between Rock Island in the State of Illinois and the Gulf of Mexico, with jurisdiction over the tributary streams only so far as such tributaries are affected by flood conditions of the Mississippi.



## FLOOD CONTROL A NATIONAL PROBLEM.

"It is my deliberate conviction that the problem of flood control is a national problem for the following reasons:

"First, because the flood areas are too large, the flood damage too great and the flood sources are too remote for effective local, or even State-wide, administration and control. No one State can successfully deal with this problem, even the protection of its own territory and people.

"In the second place, flood control by the Federal government is not only justified, by reason of the extent of the territory affected, but in my opinion, this problem is a proper subject for governmental attention because of the established economic fact that any preventable calamity, which injuriously affects the welfare and prosperity of the people of any considerable portion of the country cannot fail to have a detrimental effect upon the rest of the



Concrete Wall, Cairo, Ill., built by State in 1914, flood of April, 1927, near crest.

country. That which harms a part of the people is a matter of profound concern to all the people, especially where the calamitous conditions are incapable of control by the local community.

"Third, the Mississippi Valley contains the most fertile soil and is perhaps the most productive area in the entire United States. The lands lying in the flooded districts constitute "the bread basket and the sugar bowl" of America. The appropriations necessary to preserve the productivity of this great region, and to protect the people and property, both private and public, from future flood disaster will, in my opinion, prove to be a wise and desirable expenditure of public funds, resulting in great advantage to all the people and the government of the United States.

## EXPENDITURES WILL PAY DIVIDENDS.

"The policy of river and harbor development by the National government has proved to be of benefit to all the people, and not merely of benefit to the residents of places where a particular local improvement has been financed by the Federal government. Great as the nation's expenditures for river and harbor improvement have been, I am advised that the public benefits derived therefrom are equal to a return of 100 per cent per annum on the investment. In other words, I am told that the entire costs of river and harbor improvement, since the beginning of the government, are equalled, every year, by the reduced costs of transportation and other public benefits



resulting therefrom. I prophesy, that, in like degree, the National appropriations necessary to provide proper flood protection for the Mississippi River and its tributaries, will be returned to the people of the entire country, every year, in reduced cost of living, due to the assured productivity of the vast territory which now seeks protection at your hands.

#### DETAILED REPORT PRESENTED.

"The flood troubles of the State of Illinois occur chiefly in the valleys of the Illinois and Mississippi and are due to the heavy rainfall upon the head-waters of the streams, with consequent overflow damage on the Illinois River from Peoria to Grafton and on the Mississippi from East St. Louis to Cairo.

"I shall ask permission to insert in the record, a statement, prepared at my direction by the Division of Waterways of the State of Illinois, Mr. Wm. F. Mulvihill, Supervisor, giving in detail the information concerning flood



U. S. Government Gauge Marker, Cairo, Ill., at crest of flood, April, 1927.

conditions in Illinois, which was requested by the chairman of your committee.

"This report deals chiefly with the floods causing excessive property damage on the Illinois and Mississippi Rivers and their tributaries in the Spring of 1922—the Fall of 1926 and the Spring floods of this year.

"While the volume of flood water in 1926 in Illinois was not greatly in excess of previous records it appears that the extensive construction of levees for reclamation of lands in the natural overflow areas, caused unusual flood heights, by reducing the flood flow section of the river.

"The effect of levee construction and channel contraction is also shown in added flood heights of the Mississippi River, especially on the Cairo gauge. In this connection I desire to call especial attention to the fact that a short distance below Cairo the discharge capacity of the Mississippi River is inadequate causing the flood waters to back up—thus increasing the high water stages at Cairo and placing that city in a very precarious position.

#### ILLINOIS FLOOD LOSSES \$30,000,000 IN SIX YEARS.

"Aside from the cities of Beardstown and Cairo, the war with the flood waters of 1927 was not as spectacular in Illinois as in the vast area below the mouth of the Ohio, and it may therefore be somewhat of a surprise to



some members of your committee to learn that in the State of Illinois over 220,000 acres of the most productive reclaimed agricultural lands of the United States were completely submerged, and 200,000 additional acres of the natural flood plane were also inundated.

"There is submitted herewith a detailed tabulation of reports from engineers and officials of drainage and levee districts and municipal officers of Illinois showing estimated flood losses and consequential damage amounting to over \$30,000,000 in the past six years.

"As Governor of the State of Illinois for the past seven years, during which period our people have gone through these trying experiences and have suffered these tremendous losses, there has been impressed upon my mind the menace of the uncontrolled flood waters, and the imperative neces-



Concrete wall, Cairo, Ill., with 1927 flood several feet above railroad tracks at right.

sity for the establishment of a broad system of National flood control, through which alone, it seems to me, the recurrence of similar disasters in the future can be prevented.

#### STATE PROVIDES EMERGENCY RELIEF.

"The hardships so patiently borne by flood sufferers of Illinois, their fortitude under misfortune and their financial inability adequately to protect themselves and their property from the ravages of the rivers have impelled me, from time to time, in official messages to urge upon the legislative department of our State government the making of appropriations from the public treasury, for emergency relief of the submerged areas and for the development of plans, in conjunction with the Federal government, for permanent flood prevention through a scientific and comprehensive plan for flood control.

"Acting upon my suggestion and, in accordance with the request contained in a special message to the members of the Fifty-fifth General Assembly, representing the people of the State of Illinois, the legislature, on June 15, 1927, by joint resolutions, adopted a "memorial and petition, addressed to the President and Congress of the United States, suggesting the enlargement and extension of the powers and duties of the Mississippi River Commission to include the territory drained by the Illinois River and other tributaries of the Mississippi in the matter of flood control and protection.



"I further suggested to the General Assembly that 'While this is a problem of National scope, which must find its solution in a National program, yet as an evidence of the interest and good faith of our State, an adequate special appropriation should be made to the Department of Purchases and Construction, Division of Waterways, to provide for an engineering study of the flood situation throughout Illinois, and for use in conjunction with other states and the Federal government in the development of a comprehensive plan for the relief and protection of the people of our State, in harmony with the recommendation contained in my biennial message of January 5, 1927.'

"An appropriation of \$50,000 for this purpose was accordingly made and is now available.

APPROPRIATES \$1,500,000 FOR TEMPORARY AID.

"The General Assembly also appropriated from the State treasury the sum of \$1,500,000 'to furnish emergency relief in the areas in Illinois which have been inundated or damaged by floods and for the temporary construction, repair or reinforcement of levees in such districts.'

"That the sentiment of the people of Illinois is in favor of permanent flood control and of immediate flood relief, is indicated by the fact that the



Concrete wall, Cairo, Ill., showing timber bulkheads used at street openings.

General Assembly appropriated the sum of \$1,500,000 for emergency flood work by an almost unanimous vote. It is further evidenced by the fact that the people of the city of Chicago voluntarily contributed more than \$1,000,000 additional for flood relief purposes.

"Another appropriation of \$350,000 was made for the construction of concrete walls along the Illinois River at Beardstown and for earth levees connecting the same with the high ground back of the city, thus providing, it is hoped, some measure of permanent protection for the people of this long-suffering community.

"Thus it will be seen that the legislature of the State has this year provided nearly \$2,000,000 for flood relief work in the State of Illinois. These appropriation bills became effective on July 1st, since which time the Division of Waterways has negotiated nearly seventy contracts for the repair of flood damages (including the Beardstown river wall and levee construction), aggregating considerably more than \$1,000,000, which contracts provide for



completion of the work before January 1, 1928. The balance of the work will be contracted as rapidly as possible.

#### STATE WILL COOPERATE IN NATIONAL PLAN.

"It is said that faith without works is dead. But the State of Illinois has shown her faith by her works, and is only asking from the Federal government at this time the same thing that she herself has undertaken to do, in a limited way, for the people within her own borders, namely: To provide such immediate repair of broken levees and emergency relief, as will permit the people in the flooded areas some measure of protection against ordinary high water and thus the possibility of producing a crop on their lands in 1928, while, at the same time, making provision for careful study and an adequate program for permanent flood protection."

#### TEXT OF FLOOD REPORT PRESENTED.

The detailed report concerning flood conditions in Illinois, which was inserted in the record of the proceedings of the Flood Control Committee, follows:

#### INFORMATION CONCERNING FLOOD CONTROL REQUESTED BY CHAIRMAN OF THE FLOOD CONTROL COMMITTEE OF THE HOUSE OF REPRESENTATIVES.

*Compiled by the Division of Waterways and Presented  
by the Governor of Illinois.*

#### *Date of Floods:*

Floods causing excessive property damage occurred on the Illinois and Mississippi Rivers and their tributaries in Illinois in 1922, 1926 and 1927.

#### *Extent of Floods:*

The extent of floods causing damage were as follows: Illinois River from Peoria to Grafton, Sangamon River from Springfield to its mouth, Mississippi River from East St. Louis to Cairo.

#### *How Long Did the Floods Last:*

Sangamon River.		Illinois River.		Mississippi River.	
				E. St. Louis.	Cairo.
1922.....	48 days	1922.....	62 days	1922.....	14 days 53 days
1926.....	42 days	1926.....	66 days	1926.....	0 days 0 days
1927.....	109 days	1927.....	151 days	1927.....	33 days 75 days

#### *Depth of Water on Flooded Lands:*

The depth of water on Drainage and Levee Districts in some cases was as great as 15 feet. In the city of Beardstown on the Illinois River, 80 per cent of the city was submerged up to a maximum of about 12 feet.

#### *Compare High Water with Former Floods:*

The 1922 flood on the Illinois River was the highest on record since 1844 from LaSalle to Grafton and exceeded all previous records from Havana to Valley City but new records between these latter places were again established by the 1926 flood. The 1927 flood was approximately the same in flood heights as was the 1922 flood. Mississippi River floods were as follows:

	1844.	1903.	1913.	1922.	1926.	1927.
At St. Louis.....	41.39	38.00	27.2	33.95	29.4	36.1
At Cairo .....	46.8	50.57	54.69	53.6	40.8	56.4

#### *Cause of Floods:*

The cause of these floods was excessive rainfall upon the head-waters of the streams concerned, which, in the case of the Illinois River, was unusually excessive for such a small area. The volume of floods according to government records was not greatly in excess of previous floods but the construction of levees for the reclamation of overflowed areas had greatly re-

duced the flood flow section of the rivers and thus produced unusual flood heights for the volume of discharge of this river. The effect of levees and channel control work also affected the flood heights on the Mississippi River from East St. Louis to Cairo but to a considerable lesser degree than on the Illinois.

*Names of Places Where Levees Broke:*

The names of places where levees broke are shown on the map of Illinois attached hereto and are also listed on the attached tabulation of damages to districts and cities.

*Names of Rivers Overflowing:*

As given above and shown on map attached.

*Character of Territory Flooded:*

The principal territory flooded consisted of farm lands which had been reclaimed by levees. These reclaimed farm lands were unusually productive especially for grain. When the Drainage and Levee Districts are new, the



Bulkheading and sandbagging along Mississippi River Levee of the Cairo Drainage District flood of 1927.

yield is confined almost entirely to corn, the production being from 80 to 100 bushels per acre. In the course of ten years, the yield is reduced to about 60 bushels of corn per acre. The yield of wheat, runs from 30 to 40 bushels per acre.

*Names of Towns and Cities Flooded:*

East Peoria, Naples, Beardstown and Mounds were the places which suffered the most damage from floods. Others wholly or partly under water were Liverpool, Browning, Frederick, Meredosia and Valley City.

*General Information Relative to Places Flooded:*

The population of flooded areas in Illinois was almost entirely white except in the vicinity of Cairo, Illinois. In Beardstown the workers residing in the suburbs only were compelled to leave their homes; but at Mounds, Illinois, more than one-half of the entire population were compelled to leave the city for about four weeks in 1927. Those who were forced to evacuate their homes were taken care of in other houses and in tents on higher ground. There was no loss of life in Illinois and but few of the people were injured, none



of them seriously. There was no reported increase of sickness which could be attributed to the result of the floods except at Mounds, where a severe outbreak of typhoid occurred due to flood waters carrying contents of cess-pools throughout the city.

In the cities of Beardstown and Mounds, the effect of the floods on the morale of the people was a very marked demonstration of the pioneer fighting spirit of the American people as they turned on *en masse* and fought the floods with undiminished vigor so long as there was any possibility of protecting their community and until the waters receded the people showed a marked feeling of cheerfulness in the face of troubles which they were all experiencing. Although the city of Beardstown was under water for several weeks in the Fall of 1926 and the Spring of 1927, business was not suspended, the people going to and from their places of business in row boats or hip rubber boots. An excellent report of the Illinois River flood of 1922 was made by H. Merrill Wills, Meteorologist of Springfield, Illinois. The conditions shown by this report are also typical of the 1926 and 1927 floods. Excerpts from this report are attached.



Mississippi-River Levee at 33rd street, Cairo, Ill., showing large quantity of sand bags used at this point during flood of 1927 to prevent sloughing of inside slopes. This levee has been repaired under provisions of the State Flood Relief Act of 1927.

#### *Loss and Damage Statistics:*

These are shown in detail in the tabulation of reports received from various sources attached hereto. However, a summary of these tabulations follow:

Flooded areas, Drainage and Levee Districts.....	\$25,648,517.00
Cities flooded .....	3,267,500.00
Railroads .....	1,071,668.00
State highways .....	750,000.00

These items combined aggregate.....\$30,737,685.00

The volume and activity of business in the flooded towns and cities of Illinois is closely related to the prosperity of the agricultural districts which they serve, and except as specifically noted in the attached reports from cities, the effect of the floods on industry was similar to the effect upon agriculture. Along the Illinois and Mississippi River Valleys about 225,000 acres of land was under water from two months to two years, due to the



inability of the Drainage and Levee Districts to repair their levees and remove the water by pumps and natural drainage.

*Effect of Floods on Railroads:*

Five of the railroads operating in the flood areas report damage and losses totaling \$1,071,668.00, a total of 122.4 miles of track washed out and thirty-two bridges severely damaged or destroyed. Many of the other roads operating in these areas report that while they experienced no direct loss or appreciable delays, they were nevertheless subject to an indirect loss due to depressed business conditions in the areas affected and also the fact that when business is once lost by suspension of service embargoes, etc., it requires from six to twelve months to regain the confidence of the shippers. This indirect loss cannot be estimated but is said to be enormous.

*Effects on Highways:*

The Division of Highways reports that the damage to State roads amounts to \$750,000.00. This does not cover the damage that has been done to innumerable gravel roads maintained by the various counties, towns, etc., in the flooded areas.

Excerpts from a report of the Illinois Bankers' Association dated November 3, 1927, are as follows:



Cross Levee at Cairo, Illinois, April 27 1927, on new Levee street, showing view inside levee heavily sandbagged to check seepage and nest of sand boils around outbuilding with treatment used during their operation.

*Effect on Banks and Bank Clearings:*

The direct financial loss in actual deposits and potential deposits will aggregate many millions of dollars and will probably require from five to ten years to replace. The loss in clearings is in direct proportion to the deposit loss and the effect in large centers away from the immediate flood district will approximate 5 per cent both in deposits and clearings. In the case of a general calamity, such as these floods have produced, that result applies to every financial institution in localities affected and goes back through the correspondent banks to the reserve centers. In the ridge districts from fifteen to twenty-five miles away from the valley bottoms, the loss to the banks goes as high as 15 per cent. In the directly affected districts the bankers have to renew practically all of the local paper in addition to which other funds are required to take care of rehabilitation and current needs,



such as taxes, interest, etc. The bank deposits in Scott County were reduced over 25 per cent and thousands of dollars worth of bonds which were held as savings have had to be sold on the market to aid in liquidating losses.

In Lawrence County the loss on each flood would probably run one-half a million dollars.

In Mason County the bank resources and clearings in the eastern half of the county which is not in the area of the floods decreased 10 per cent, while in the directly affected area the loss was 20 per cent. Pike County's loss in clearings and resources is about 25 per cent, while in Greene County a loss of 40 per cent is recorded.

From this survey it is our opinion that no profit has been possible for either landlords or tenants operating lands subject to overflow in the years mentioned. As a direct result, banks serving such territory have suffered withdrawal of practically all deposits of those customers and have been unable to collect a large percentage of their interest, and has made necessary a further extension of time on loans made and of additional credit. The effect is the weakening of confidence and a withdrawal of an uncertain amount of credit from river bottom lands.

#### *Levees:*

The location and extent of levees is shown on the attached map. These levees were built by the land owners either as individuals or as groups in Drainage and Levee Districts organized under the laws of the State which laws up to June 10, 1911, vested final authority for the location and construction of levees in the county courts. Since 1917, levee construction in the State of Illinois has been subject to the approval of the Division of Waterways of the Department of Purchases and Construction, successor to the Department of Public Works and Buildings. The construction of levees for land reclaimed was paid for by private owners or by assessments levied by the Drainage and Levee Districts.

Along the Mississippi River, the Federal government contributed to the expense of the construction of a few miles of levee through the Mississippi River Commission under the Federal laws governing that commission. No contributions have been made by the State for the construction of levees for land reclamation. Such contributions are barred by the provisions of the State Constitution. Contributions of \$2,237,000.00 have been made by the State for the protection of cities and flooded areas as follows:

City.	Year.	State.	Other Resources.	Total.
Beardstown .....	1927	\$350,000		\$ 350,000
Cairo—Prior to .....	1913	?	\$1,546,000	
" .....	1913	\$250,000	168,000	
" .....	1915	25,000		
" .....	1927	250,000		
				2,239,000
Mounds .....	1927	\$ 7,000		7,000
Mound City .....	1913	50,000		
" " .....	1915	10,000		
" " .....	1927	12,000		
				72,000
Naples .....	1913	\$3,000		
" .....	1926	8,847		
				11,847
Shawneetown .....	1913	\$39,000		
" .....	1915	10,000		
				49,000
Levied farm lands:				
Under contract .....	1927	\$282,000		
Funds available .....	1927	949,000		
				1,231,000
				\$3,959,847

The State of Illinois, with the appropriation under S. B. 576 attached, will repair damages to levees so as to provide protection against ordinary floods until such time as permanent control projects can be completed.



*Federal Legislation Needed:*

Acting upon my suggestion and, in accordance with the request contained in a special message to the members of the Fifty-fifth General Assembly, representing the people of the State of Illinois, the legislature, on June 15, 1927, by joint resolution, adopted a "memorial and petition, addressed to the President and Congress of the United States, suggesting the enlargement and extension of the powers and duties of the Mississippi River Commission to include the territory drained by the Illinois River and other tributaries of the Mississippi in the matter of flood control and protection; and also that a new Federal commission, including representatives of the various States



Mississippi River Levee of Cairo Drainage District, flood of 1927, showing sandbagging along inside toe to prevent sloughing.

in the flood area, be created, either by appointment of the President, or by an Act of Congress, to give immediate attention to the problem of flood control and the utilization of flood waters as far as practicable to the development of the material resources of our country."

*How Can Flood Problem be Solved:*

It is believed that the flood problem of the Mississippi River and its tributaries can best be solved by a National commission with which should cooperate the States which are effected. The other questions on pages 4 and 5 of the questionnaire of the flood control committee can best be answered by a National commission charged with a solution of the problem.

TABULATION OF REPORTS SHOWING ESTIMATED LOSSES AND DAMAGES DUE TO FLOODS.

Drainage and levee district and county.	Year.	Damage to levees.	Fighting floods.	*Crop losses.	**All other damage.	District totals for years shown.
Armstrong (private)-----	1922	\$ 400	\$ 200	\$ 2,000	\$ 500	\$3,100
Cass County-----	1926	850	250	4,000	1,200	6,300
365 acres-----	1927	200	100	4,200	800	5,300
Total-----						\$14,700



TABULATION OF REPORTS SHOWING ESTIMATED LOSSES AND DAMAGES DUE TO  
FLOODS—Continued.

Drainage and levee district and county.	Year.	Damage to levees.	Fighting floods.	*Crop losses.	**All other damage.	District totals for years shown.
Banner Special.....	1922	\$18,686	\$2,500		\$ 2,700	\$ 23,886
Peoria and Fulton Counties.....	1926	74,000	5,000	99,000	20,000	198,000
4,000 acres.....	1927	30,000	2,000	109,000	12,200	153,200
Total.....						\$375,086
Big Swan.....	1922	\$ 1,000	\$ 5,000	\$205,000	\$12,000	\$223,000
Scott County.....	1926	40,000	35,000	450,000	15,000	540,000
12,000 acres.....	1927					
Total.....						\$763,000
Big Lake.....	1922	\$20,000	\$3,500			23,500
Schuyler County.....	1926		3,000			3,000
3,300 acres.....	1927		2,500			2,500
Total.....						\$29,000
Cairo.....	1922	\$ 2,500	\$ 1,000	\$150,000	\$110,000	\$263,500
Alexander County.....	1926	500	1,000	1,000	2,500	5,000
6,440 acres.....	1927	300,000	300,000	165,000	150,000	915,000
Total.....						\$1,183,500
Chandlerville.....	1922	\$3,500	\$ 850	\$20,400	\$2,000	\$26,750
Cass County.....	1926	2,600	1,500	16,400	1,000	21,500
2,000 acres.....	1927	650	300	26,500	3,000	30,450
Total.....						\$78,700
Chautauqua.....	1922	\$100,000				\$100,000
Mason County.....	1926	125,000	\$2,500	\$75,000	\$50,000	252,500
3,800 acres.....	1927	20,000				20,000
Total.....						\$372,500
Chouteau, Nameoki and Venice.....	1922	\$25,000	\$3,500	\$12,500	\$1,000	\$19,500
Madison County.....	1926					
17,500 acres.....	1927	4,500	6,000	25,000	3,000	38,500
Total.....						\$58,000
Chouteau Island.....	1922	\$ 3,937	\$271	\$ 9,000		\$13,208
Madison County.....	1926					
2,037 acres.....	1927	26,703	673	68,000	\$33,000	128,376
Total.....						\$141,584
Clear Creek.....	1922	\$ 5,000	\$1,000	\$200,000	\$10,000	\$216,000
Union County.....	1926	1,000		50,000	5,000	56,000
19,130 acres.....	1927	60,000	2,000	350,000	15,000	427,000
Total.....						\$699,000
Clear Lake Special.....	1922	\$22,600	\$1,500	\$40,000	\$ 5,000	\$69,100
Cass County.....	1926	30,000	1,650	17,000	45,000	93,650
3,664 acres.....	1927					
Total.....						\$162,750
Coal Creek.....	1922	\$125,000	\$ 4,000	\$209,000	\$135,000	\$473,000
Schuyler County.....	1926	5,000	13,000	60,000		78,000
6,800 acres.....	1927	5,000	12,000	160,000		177,000
Total.....						\$728,000
Cohen Bros. (private).....	1922	\$3,000	\$300	\$ 7,000	\$1,000	\$11,300
Randolph County.....	1926	500	100	2,000		2,600
1,000 acres.....	1927	6,000	400	10,000	2,500	18,900
Total.....						\$32,800

TABULATION OF REPORTS SHOWING ESTIMATED LOSSES AND DAMAGES DUE TO  
FLOODS—Continued.

Drainage and levee district and county.	Year.	Damage to levees.	Fighting floods.	*Crop losses.	**All other damage.	District totals for years shown.
Columbia.....	1922	\$ 2,500	\$2,500	\$ 10,000	\$10,000	\$25,000
Monroe County.....	1926	2,500	2,500	10,000	10,000	25,000
15,000 acres.....	1927	20,000	5,000	100,000	75,000	200,000
Total.....						\$250,000
Coon Run.....	1922					
Morgan and Scott Counties.....	1926	\$1,200		\$50,000	\$5,000	\$56,200
4,500 acres.....	1927			25,000		25,000
Total.....						\$81,200
Crabtree.....	1922	\$ 1,000				\$ 1,000
Fulton County.....	1926	12,000	\$800	\$30,000		42,800
1,200 acres.....	1927			40,000	\$2,000	42,000
Total.....						\$85,800
Crane Creek.....	1922	\$90,000	\$5,000	\$120,000	\$18,000	\$233,000
Schuyler County.....	1926	16,000	19,000	60,000	6,000	101,000
5,000 acres.....	1927	12,000	4,000	60,000	6,000	82,000
Total.....						\$416,000
Degognia and Fountain Bluff.....	1922	\$30,000	\$25,000	\$600,000		\$655,000
Jackson County.....	1926	10,000				10,000
29,260 acres.....	1927	75,000	25,000	600,000		700,000
Total.....						\$1,365,000
East Liverpool.....	1922	\$35,000	\$2,000			\$37,000
Fulton County.....	1926	50,000	1,500	\$200,000	\$10,000	261,500
3,300 acres.....	1927					
Total.....						\$298,500
Fairbanks.....	1922	\$150,000		\$250,000	\$50,000	\$450,000
Greene County.....	1926	5,000	\$2,000	150,000	10,000	167,000
8,000 acres.....	1927			40,000		40,000
Total.....						\$657,000
Farmers.....	1922	\$5,000	\$3,500	\$6,500		\$15,000
Mason and Cass Counties.....	1926	25,000	5,000	20,000		50,000
9,100 acres.....	1927	3,500	750	7,500		11,750
Total.....						\$76,750
Fort Chartress and Ivy Landing.....	1922					
Monroe County.....	1926					
10,500 acres.....	1927	\$3,000	\$1,724	\$49,900	\$5,200	\$59,824
Hager Slough.....	1922	\$2,000		\$150,000	\$20,000	\$172,000
Cass County.....	1926	4,000		200,000	40,000	244,000
3,240 acres.....	1927	4,000		150,000	20,000	174,000
Total.....						\$590,000
Harrisonville and Ivy Landing.....	1922		\$3,000	\$ 5,000	\$ 5,000	\$ 13,000
Monroe County.....	1926			2,000	1,000	3,000
1,800 acres.....	1927	\$5,000	4,500	301,750	22,500	333,750
Total.....						\$349,750
Hartwell.....	1922	\$200,000		\$300,000	\$50,000	\$550,000
Greene County.....	1926		\$1,000	160,000		161,000
8,800 acres.....	1927			50,000		50,000
Total.....						\$761,000
Hennipen.....	1922					
Putnam County.....	1926			\$831,600	\$1,759,200	\$2,590,800
2,585 acres.....	1927					



TABULATION OF REPORTS SHOWING ESTIMATED LOSSES AND DAMAGES DUE TO  
FLOODS—Continued.

Drainage and levee district and county.	Year.	Damage to levees.	Fighting floods.	*Crop losses.	**All other damage.	District totals for years shown.
Hillview.....	1922	\$15,000	\$20,000	\$75,000		\$110,000
Greene and Scott Counties.....	1926	40,000	60,000	210,000		310,000
12,300 acres.....	1927	5,000	20,250	135,000		160,250
Total.....						\$580,250
Jobs Creek.....	1922	\$1,000		\$5,000	\$1,000	\$7,000
Cass County.....	1926	7,000	\$300	10,000	5,000	22,300
1,440 acres.....	1927	14,000	500	18,000	10,000	42,500
Total.....						\$71,800
Kaskaskia Island.....	1922	\$ 2,500	\$ 500	\$ 50,000	\$60,000	\$113,000
Randolph County.....	1926	500		5,000	25,000	30,500
10,000 acres.....	1927	50,000	4,000	150,000	75,000	279,000
Total.....						\$422,500
Kerton Valley.....	1922		\$ 400			\$ 400
Fulton County.....	1926		500	\$76,000	\$ 300	76,800
1,700 acres.....	1927	\$6,000	1,200	85,000	18,000	110,200
Total.....						\$187,400
Lacey.....	1922		\$12,000			\$ 12,000
Fulton County.....	1926	\$130,000	6,000	\$60,000	\$60,000	256,000
3,000 acres.....	1927			89,000		89,000
Total.....						\$357,000
Langellier.....	1922	\$10,000	\$15,000			\$ 25,000
Fulton County.....	1926	45,000	1,000	\$65,000	\$30,000	141,000
2,050 acres.....	1927	5,000		65,000	Inc. above	70,000
Total.....						\$236,000
Little Creek.....	1922	\$5,000	\$2,000	\$20,000	\$10,000	\$37,000
Brown County.....	1926	7,000	1,000	25,000	15,000	48,000
2,000 acres.....	1927	1,000		30,000	5,000	36,000
Total.....						\$121,000
Liverpool.....	1922					
Fulton.....	1926	\$10,142	\$17,163	\$20,000	\$50,000	\$97,305
3,300 acres.....	1927					
Lost Creek.....	1922	\$14,000	\$1,800	\$32,000	\$27,000	\$74,800
Cass County.....	1926	10,000	500	36,000		46,500
2,951 acres.....	1927	20,000	300	22,000		42,300
Total.....						\$163,600
Lower Indian Creek.....	1922	\$2,000		\$10,000	\$1,000	\$13,000
Cass County.....	1926	3,000	\$500	20,000		23,500
2,300 acres.....	1927	3,000		35,000		38,000
Total.....						\$74,500
Lower Salt Creek.....	1922	\$10,000	\$15,000	\$100,000	\$10,000	\$135,000
Logan County.....	1926	25,000	50,000	200,000	50,000	325,000
10,900 acres.....	1927		25,000	125,000	10,000	160,000
Total.....						\$620,000
McGee Creek.....	1922	\$20,000	\$25,616	\$125,000		\$170,616
Pike and Brown.....	1926	28,000	6,000	351,510	\$ 47,000	432,510
10,800 acres.....	1927	27,000	800	400,000	100,000	527,800
Total.....						\$1,130,926
McNiel Farm (private).....	1922	\$300	\$1,000	\$ 5,000	\$2,000	\$ 8,300
Cass County.....	1926	1,000	300	10,000	2,000	13,300
160 acres.....	1927	200		10,000	2,000	12,200
Total.....						\$33,800

TABULATION OF REPORTS SHOWING ESTIMATED LOSSES AND DAMAGES DUE TO  
FLOODS—Continued.

Drainage and levee district and county.	Year.	Damage to levees.	Fighting floods.	*Crop losses.	**All other damage.	District totals for years shown.
Mason and Cass River.....	1922			\$4,000		\$4,000
Mason and Cass Counties.....	1926					
10,840 acres.....	1927			8,500		8,500
Total.....						\$12,500
Mason and Menard.....	1922	\$ 1,500	\$1,000	\$15,000	\$15,000	\$ 32,500
Mason and Menard Counties.....	1926	20,000	4,000	60,000	20,000	104,000
7,000 acres.....	1927	2,000	2,000	40,000	20,000	64,000
Total.....						\$200,500
Mauvaisterre.....	1922			\$30,000	\$10,000	\$40,000
Scott County.....	1926	\$10,000	\$2,000	25,000	10,000	47,000
4,000 acres.....	1927	9,000	2,500	15,000	15,000	41,500
Total.....						\$128,500
Meredosia Lake.....	1922	\$35,000	\$10,000	\$ 62,300	\$15,000	\$122,300
Cass and Morgan Counties.....	1926	30,000	10,000	75,000	10,000	125,000
3,761 acres.....	1927	10,000	8,000	120,000	15,000	153,000
Total.....						\$400,300
Middle Creek No. 1.....	1922	\$200	\$100	\$ 7,660	\$300	\$ 8,260
Cass County.....	1926	400	200	15,320	400	16,320
1,100 acres.....	1927	800	300	16,410	200	17,710
Total.....						\$42,290
Moredock and Ivy Landing.....	1922	\$20,000	\$8,000	\$100,000		\$128,000
Monroe County.....	1926					
16,700 acres.....	1927					
Mounds.....	1922			\$15,000	\$ 60,000	\$ 75,000
Pulaski County.....	1926					
720 acres.....	1927			25,000	550,600	575,600
Total.....						\$650,600
New Pankey's Pond Special.....	1922					
Cass and Morgan Counties.....	1926	\$9,000	\$200	\$15,125	\$ 5,000	\$29,325
1,432 acres.....	1927	2,000	300	30,000	10,000	42,300
Total.....						\$71,625
North Fork (outlet).....	1922	\$10,000	\$2,000	\$225,000	\$10,000	\$247,000
Christian-Macon-Sangamon.....	1926	5,000	1,000	450,000	30,000	486,000
10,680 acres.....	1927	5,000	1,000	225,000	30,000	261,000
Total.....						\$994,000
Oakes (private).....	1922	\$ 500	\$75	\$17,640	\$1,120	\$19,335
Scott County.....	1926	450	25	11,850	1,200	13,525
650 acres.....	1927	4,200		24,430	1,400	30,030
Total.....						\$62,890
Oakford Special.....	1922					
Menard County.....	1926	\$15,000	\$2,500	30,000	\$15,000	\$62,500
2,300 acres.....	1927	1,000	500	20,000		21,500
Total.....						\$84,000
Oakford (private).....	1922					
Menard County.....	1926					
325 acres.....	1927	\$6,000	\$200	\$45,000		\$51,200
Osborne (private).....	1922	\$1,000		\$1,000		\$ 2,000
Logan County.....	1926	8,000		5,200		13,200
400 acres.....	1927	3,000		6,800		9,800
Total.....						\$25,000



TABULATION OF REPORTS SHOWING ESTIMATED LOSSES AND DAMAGES DUE TO  
FLOODS—Continued.

Drainage and levee district and county.	Year.	Damage to levees.	Fighting floods.	*Crop losses.	**All other damage.	District totals for years shown.
Pekin and LaMarsh.....	1922	\$115,000	\$5,000	\$ 70,000	\$10,000	\$200,000
Peoria County.....	1926	50,000	4,000	100,000	6,000	160,000
2,721 acres.....	1927					
Total.....						\$360,000
Prairie DuPont.....	1922					
St. Clair and Monroe Counties.....	1926					
5,700 acres.....	1927	\$3,000	\$1,627	\$45,000	\$5,000	\$54,627
Preston.....	1922	\$20,000	\$7,000	\$100,000	10,000	137,000
Union County.....	1926					
16,200 acres.....	1927	50,000		75,000	40,000	165,000
Total.....						\$302,000
Salt Creek.....	1922	\$10,000	\$ 2,000	\$ 25,000		\$ 37,000
Mason and Menard Counties.....	1926	40,000	10,000	273,000		540,000
11,000 acres.....	1927					
Total.....						\$577,000
Seahorn.....	1922	\$2,500	\$4,000	\$ 5,000		\$11,500
Fulton County.....	1926	5,000	6,000	15,000	\$50,000	76,000
1,743 acres.....	1927	1,000	3,000	10,000	36,200	50,200
Total.....						\$137,700
Scott County.....	1922	\$100,000	\$5,000	\$200,000	\$100,000	\$405,000
Scott County.....	1926	25,000	6,000	225,000	100,000	356,000
10,230 acres.....	1927			225,000		225,000
Total.....						\$986,000
Spoon River.....	1922	\$1,500	\$500	\$20,000	\$2,000	\$24,000
Fulton County.....	1926	2,000	300	18,000	1,000	21,300
2,500 acres.....	1927	2,500	400	30,000	1,500	34,400
Total.....						\$79,700
Spring Lake.....	1922	\$96,000	\$16,000			\$112,000
Tazewell County.....	1926	25,000	12,000			37,000
12,100 acres.....	1927	25,000	14,000			39,000
Total.....						\$188,000
South Beardstown.....	1922	\$2,000	\$1,000	\$ 500	\$2,000	\$5,500
Cass County.....	1926	1,000	2,000	1,000	2,000	6,000
8,100 acres.....	1927	1,000	500	2,000	2,000	5,500
Total.....						\$17,000
Stringtown.....	1922					
Monroe and Randolph.....	1926					
3,000 acres.....	1927	\$2,000	\$734	\$14,000	\$6,400	\$23,134
Ten Mile.....	1922	\$12,000		\$18,000		\$30,000
Tazewell County.....	1926	5,000		9,000		14,000
330 acres.....	1927			4,000		4,000
Total.....						\$48,000
Turner (private).....	1922		\$100	\$5,000		\$ 5,100
Tazewell County.....	1926	\$4,000	250	8,000		12,250
2,500 acres.....	1927			9,000		9,000
Total.....						\$26,350

TABULATION OF REPORTS SHOWING ESTIMATED LOSSES AND DAMAGES DUE TO  
FLOODS—Concluded.

Drainage and levee district and county.	Year.	Damage to levees.	Fighting floods.	*Crop losses.	**All other damage.	District totals for years shown.
Turner and Crabb-----	1922	\$3,000	\$2,000	\$4,000		\$ 9,000
	1926	2,500	150	8,000		10,650
2,000 acres-----	1927			6,000		6,000
Total-----						\$25,650
Turner and Hergete-----	1922	\$ 5,000	\$1,500			\$ 6,500
Mason County-----	1926	20,000	1,000	\$22,500		43,500
2,500 acres-----	1927		500	32,000		32,500
Total-----						\$82,500
Valley-----	1922	\$11,000	\$ 8,000	\$ 8,000	\$ 5,000	\$32,000
Cass County-----	1926	5,000	10,000	25,000	10,000	50,000
3,200 acres-----	1927	5,000	7,500	30,000	5,000	47,500
Total-----						\$129,500
Valley City-----	1922	\$ 9,500	\$7,650	\$ 5,000	\$15,000	\$ 37,150
Pike County-----	1926	10,000	2,500	90,000	10,000	112,500
4,800 acres-----	1927	15,000	5,250	50,000	10,000	80,250
Total-----						\$229,900
West Matanzas-----	1922	\$10,000	\$10,000			\$ 20,000
Fulton County-----	1926	50,000	1,500	\$100,000	\$30,000	181,500
2,700 acres-----	1927	10,000	500	100,000	Inc. above	110,500
Total-----						\$312,000
George White (private)-----	1922	\$1,500	\$300	\$3,000	\$9,000	\$13,800
Logan County-----	1926	3,000	400	2,500	8,000	13,900
100 acres-----	1927	3,500	150	2,500	6,000	12,150
Total-----						\$39,850
Winchester (private)-----	1922					
Scott County-----	1926	\$3,093		\$25,000		\$28,093
450 acres-----	1927					

\* "Crop Losses" includes the value of crops actually destroyed and also losses from failure to make a crop due to flood conditions.

\*\* "Other Damages" includes loss and damage to others outside the district due to flood in that district as well as that district losses.

## SUMMARY.

Reported losses from flooded areas and Drainage and Levee

Districts aggregating 399,204 acres—Total.....\$22,814,734.00

Estimated losses for areas and Drainage and Levee Districts

not heard from aggregating 48,135 acres (figured on the aver-

age loss per acre of those reported)—Total..... 2,833,783.00

Grand Total .....\$25,648,517.00



TABULATION OF REPORTS GIVING INFORMATION ON FLOOD LOSSES,  
IN CITIES ONLY.

City of East Peoria (combined for 1926 and 1927 only).

Public utilities.	Municipal property.	Schools.	Homes.	Total.
\$187,000	\$98,000	\$8,500	\$115,000	\$408,500
Manufacturing interests.	Wholesale and retail business.	Fighting flood.	Damage to levees.	Total.
\$844,000	\$48,000	\$12,000	\$20,000	\$924,000
Pumping water out of levee district.	All other damages.			Total.
\$25,000	\$45,000			\$70,000
Total.....				\$1,402,500

Mound City—

	Public utilities.	*Municipal losses.	Schools.	Homes.	Total.
1922.....	\$20,000		\$1,000	Not given.	\$21,000
1926.....				Not given.	
1927.....	100,000	400,000	5,000	Not given.	505,000
	Manufacturing interests.	Wholesale and retail interests.	Fighting flood.	Damage to levees.	Total.
1922.....	\$ 25,000	\$ 25,000	\$4,000	\$10,000	\$ 64,000
1926.....			1,000		1,000
1927.....	250,000	200,000	8,000	75,000	533,000

Total losses for 1922..... \$ 85,000  
 Total losses for 1926..... 1,000  
 Total losses for 1927..... 1,038,000

Total..... \$1,124,000

\* Includes decline in real estate valuations.

Beardstown (combined for 1926-1927 only).

Public utilities.	Municipal Property.	Schools.	Homes.	Total.
\$30,000	\$15,000	\$25,000	\$100,000	\$170,000
Manufacturing interests.	Wholesale and retail business.	Fighting floods.	Levees.	Total.
\$25,000	\$100,000	\$50,000	\$396,000	\$571,000
Total.....				\$741,000
Total reported from cities.....				\$3,267,500

## TABULATION OF FLOOD LOSSES REPORTED BY RAILROADS.

Several roads, other than those listed, report that, while they had no direct loss or damage, they were subject to considerable indirect loss due to depressed business conditions in the areas affected and also the fact that when the business is once lost, it requires six to twelve months to regain the confidence of the shippers.

This amount is somewhat undetermined, but if combined, might be placed at close to \$2,000,000.00.

## Chicago &amp; North Western Railroad—

Year.	Direct loss.	*Indirect loss.	Miles of road-bed damaged.	Number of bridges damaged.
1922.....	\$25,000	\$20,000	2½	3
1926.....	30,000	40,000	7	8
1927.....	35,000	50,000	4½	5
Total.....	\$90,000	\$110,000	14	16

Remarks { 1922—  
1926—  
1927—

## Illinois Traction System—

Year.	Direct loss.	*Indirect loss.	Miles of road-bed damaged.	Number of bridges damaged.
1922.....	\$44,318	\$60,000	.7	4
1926.....	30,758	6,000	.4	3
1927.....	91,692	16,000	.3	—
Total.....	\$166,768	\$82,000	1.4	7

Remarks { 1922—Traffic completely interrupted Spring Valley to Princeton, Aug. 3 to Dec. 1.  
1926—  
1927—Freight traffic, particularly, demoralized for a considerable period.

## Illinois Central System—

Year.	Direct loss.	*Indirect loss.	Miles of road-bed damaged.	Number of bridges damaged.
1922.....	\$ 17,000	Not estimated but said to be enormous.	27	2
1926.....	None		None	None
1927.....	222,400		32	4
Total.....	\$239,400		59	6

Remarks { 1922—All traffic Murphysboro-St. Louis division interrupted for about 30 days.  
1926—  
1927—Complete interruption of all traffic Grand Tower, Thebes, Mounds, Mound City from April 15th to May 15th.



TABULATION OF FLOOD LOSSES REPORTED BY RAILROADS—Concluded.  
Cleveland, Cincinnati, Chicago & St. Louis (Big Four) R. R.—

Year.	Direct loss.	*Indirect loss.	Miles of road-bed damaged.	Number of bridges damaged.
1922.....	\$ 4,500	Not estimated but said to be enormous.	4	2
1926.....	None		None	None
1927.....	50,000		8	0
Total.....	\$54,500		12	2

Remarks { 1922—Flood did not materially affect traffic.  
1926—Flood did not materially affect traffic.  
1927—All traffic entirely out of service in Cairo district for nine days.

Chicago, Burlington & Quincy R. R.—

Year.	Direct loss.	*Indirect loss.	Miles of road-bed damaged.	Number of bridges damaged.
1922.....	\$141,000	Not estimated but said to be enormous.	12	0
1926.....	147,000		12	0
1927.....	41,000		12	1
Total.....	\$329,000		36	1

Remarks { 1922—All traffic completely interrupted from Browning to Beardstown for eight days.  
1926—All traffic completely interrupted from Browning to Beardstown for twelve days. Coal traffic from southern Illinois had to be detoured via B. & O. to East St. Louis, Galesburg and Quincy at greatly increased cost. Approximately 4,000 cars of coal were lost.  
1927—Traffic seriously interrupted, Browning to Beardstown.

Total losses of five railroads—	
Direct loss.....	\$879,668
Indirect loss.....	192,000
Total.....	\$1,071,668

RECAPITULATION OF FLOOD LOSSES REPORTED FROM VARIOUS SOURCES.	
Drainage and Levee Districts and areas affected by floods report losses and damages totaling.....	\$25,648,517.00
Cities in flooded areas report losses and damages totaling.....	3,267,500.00
Reported losses of railroads operating in flooded areas report direct and indirect losses totaling.....	1,071,668.00
Division of Highways report losses from damage to State roads totaling .....	750,000.00
Grand Total .....	\$30,737,685.00

HUGHES' REPORT RE DIVERSION OF WATER.

As recorded in our last annual report, for the year ending June 30, 1927, engineers of the Division of Waterways devoted considerable time during that fiscal year in preparing data and in presenting evidence at the lake level hearings, held in Washington by Charles Evans Hughes, former Justice of the United States Supreme Court, who, on June 7, 1926, by order of said court, had been appointed Special Master to take testimony and report to the court his conclusions of law and fact in the

case of the so-called lake states to enjoin the State of Illinois and the Sanitary District of Chicago from diverting water from Lake Michigan into the Mississippi watershed.

The original bill was filed by the State of Wisconsin in 1922 and is still pending. The report and conclusions of the Special Master was filed during the October term, 1927. Because of the importance of this litigation a brief review thereof, abstracted from a report by Attorney Cornelius Lynde to the Chicago Association of Commerce, and published in "Chicago Commerce," December 3, 1927, is included herein.

#### THE FEDERAL SUIT OF 1908.

Early in 1908, the General Assembly of Illinois, at a special session, voted to submit to popular vote a proposed amendment to the State Constitution authorizing a bond issue of \$20,000,000 for the construction of a deep waterway from the end of the Sanitary and Ship Canal at Lockport, 35 miles from Chicago, to connect with the navigable waters of the Illinois River near Utica, Illinois.

While this question was pending, and prior to the November election of 1908, a so-called friendly suit was filed by the Federal government in the United States District Court at Chicago to enjoin the Sanitary District of Chicago from diverting more water for sewage dilution than had been authorized in 1903-5 by the Secretary of War, viz., 4,167 cubic feet per second. The Sanitary District, operating under a law of Illinois which required dilution of sewage on the basis of population, was obligated to use an average in excess of 8,500 cubic feet per second. Wisconsin and other complainant states intervened as friends of the United States in the above Federal suit, which was finally decided in 1925 in favor of the Government by the United States Supreme Court which sustained the position of the War Department and entered a decree enjoining the Sanitary District from exceeding the permit of the Secretary of War, but without prejudice to any new permit the Secretary might issue in accordance with law.

The decree, by order of the court, did not go into effect for 90 days, and within that time the Sanitary District made application for a new permit. After public hearing and earnest consideration, on March 3, 1925, the then Secretary of War, Mr. Weeks, granted the present permit, authorizing a diversion of 8,500 c.f.s. and attaching many and onerous conditions, which Judge Hughes finds in his decision have been lived up to.

#### LAKE STATES NOT SATISFIED.

The lake states were not satisfied with the decision of the Secretary of War, and in October, 1925, the State of Wisconsin, together with Minnesota, Ohio and Pennsylvania, filed an amended bill in which they sought to enjoin any diversion whatever, and alleged that the permit of the Secretary of War was invalid as in excess of lawful authority. The only injury claimed by these complaining states was the alleged injury to navigation due to claimed lowering of the levels of the Great Lakes produced by the diversion. Thereafter the State of Michigan filed a bill containing practically the same averments as the Wisconsin bill, but



setting forth riparian damage, that is, a claim of injury to docks, wharves, bathing beaches, fishing grounds, etc. And later the State of New York filed a similar bill containing both grounds and raising a further issue as to injury to power rights, which subsequently the Supreme Court, on motion of the defendants, dismissed without prejudice from the proceeding.

In due course answers were filed and the Mississippi Valley States of Missouri, Kentucky, Tennessee and Louisiana, came in upon petition and obtained leave to be joined as defendants with Illinois and the Sanitary District in opposing the granting of any decree to cut off the diversion.

#### ALL RIVER STATES SUPPORT DIVERSION.

When these complaining states had intervened in the government case the Chicago Association of Commerce brought to the attention of the Mississippi Valley states their interest in the diversion by reason of its beneficial effect upon navigation in the Lakes-to-the-Gulf Waterway, down the Illinois River and the Mississippi. And these four states obtained leave to appear as friends of the court on the side of Illinois in the government case.

In addition to the aforementioned, the States of Mississippi and Arkansas subsequently came in, adopting as their own the answer previously filed on behalf of the original four Mississippi states. Thus every state on the Mississippi from Illinois to its mouth appeared before the Supreme Court to oppose the cessation of the diversion. Subsequently Charles Evans Hughes was appointed Special Master to hear the case, and the matter was on hearing during a large part of last winter, being argued before the Special Master early in June (1927).

His report follows the direction of the court and makes findings of fact, presents his conclusions of law, and his recommendation for a decree, which is that the bills be dismissed, in view of his decision that the complainants are not entitled to the relief sought, but without prejudice to the right of the complainants to institute a suit to prevent a diversion from Lake Michigan, in case such diversion be made or attempted without authority of law. In other words, the right is reserved to these states to commence suit anew if Illinois should seek to divert water without a permit from the Secretary of War or other Federal authority.

#### A COMPREHENSIVE REVIEW OF ISSUES.

The Special Master's report, consisting of 197 printed pages, is a complete and comprehensive review of all of the issues presented, and reaches a conclusion upon practically every contention advanced by either side. The findings begin with a description of the site of the drainage canal, stressing the fact that the continental divide separating the St. Lawrence and Mississippi watersheds at its lowest point is only some 10 miles from the shore of Lake Michigan, and not in excess of 10 feet above the level of the lake.

The Master finds that in earlier ages Lake Michigan had an outlet to the south, and finds that during the period of exploration of this western country the route of the drainage canal, which was a marsh

connecting the headwaters of the Chicago River and the DesPlaines River, formed a natural thoroughfare for the Indians and later explorers and the French *coureurs de bois*.

The Master finds as to the history of the Illinois and Michigan Canal, which was commenced pursuant to Acts of Congress in 1822 and 1827, originally intended as a water level canal connecting the waters of Lake Michigan with those of the Illinois River, by reason of lack of funds was made with locks lifting the water over the height of land, and later on in order to remove pollution from the Chicago River, which from the beginning had served as the sewer of the city, was deepened in accordance with the original plan.

#### PUMPS PROVE INSUFFICIENT.

By 1871 the flow was insufficient to solve the sewage necessities, and pumps were installed. But the growth of the city and coincident lowering of the levels of the Great Lakes prevented these measures from being sufficient, as the canal was naturally small, and by 1880 it was clear that some solution for the sanitary difficulties of this rapidly growing city was necessary.

The report goes into the history of the Sanitary District, and finds that the plan by which water from the lake was to be diverted in sufficient volume to dilute sewage and thus prevent the pollution of Chicago's water supply was the result of careful study. The report pays considerable attention to the various Acts of Congress, taking note of the existence of the District, making appropriations for the deepening of the Chicago River in order to accommodate it for the reversal of flow, in accordance with the plan of the District, and in main sustaining the contentions of the defendants as to the history of Federal action, in connection with this controversy prior to the permit of March 3, 1925. *The Special Master finds as a fact that the defendants have complied substantially with the conditions of the permit since its issuance.*

#### EFFECT OF DIVERSION ON LAKE LEVELS.

As to the effect of the diversion on the level of the Great Lakes the Special Master finds that the levels have been affected by the following artificial factors: The regulating works in the St. Marys River at the outlet of Lake Superior, which have deprived the lower lakes of the natural flow from Lake Superior; the diversion of the Chicago Sanitary District from Lake Michigan; diversions from Lake Erie for power and navigation, through the Welland Canal, and from the Niagara River; and changes in the discharge capacity of the St. Clair River at the outlet of Lake Huron, as a result of which an increasing volume of water has been drawn off from Lakes Huron and Michigan; and similar changes in the St. Lawrence River; affecting the level of Lake Ontario.

#### INJURY NOT ASCERTAINABLE.

In addition to that the Master finds as a matter of fact that there are constant fluctuations in the levels of the lakes due to changes in rainfall and evaporation, as a result of which, based upon expert testimony as to a highly complicated problem, the Special Master finds that the full effect of the present diversion would be to lower the levels of



Lake Michigan and Huron approximately six inches at mean levels; Lakes Erie and Ontario five inches; and similarly, of course, the levels of connecting rivers, bays and harbors. The Master found that this effect would in fact produce injury to navigation conducted on the Great Lakes but that the amount of this injury which could be apportioned to the Chicago diversion, in view of the fact that material lowering of the levels was contributed to by other causes, was impossible of ascertainment.

The Master also found that the complainant states' claim of injury to horticultural interests due to the change in the levels of the lakes was not proved, but that in addition to the injury to navigation there was injury to riparian rights.

#### DIVERSION AIDS MISSISSIPPI RIVER NAVIGATION.

The Mississippi Valley states and the State of Illinois contended that the water diverted from Lake Michigan through the Sanitary District Canal was highly beneficial to navigation on the Illinois River and on the Mississippi from Grafton south. These contentions the report of the Special Master sustains. The Master found that the exact effect of the diversion upon the navigation of the Mississippi by reason of the constant variations in the flow of that stream and the tendency of bars to form in its silt laden current was difficult of exact appraisal but finds that the diversion, to some extent, during low water period increases navigable depths over the bars on the Mississippi and that it was permissible on all the facts for the Secretary of War to reach the conclusion that the diversion was an aid to the navigation of the Mississippi in times of low water.

It is worthy of note that the Mississippi Valley states offered in evidence a day to day record of the navigation operations of the government barge line on the Mississippi, and difficulties due to insufficient channel depth and width were found in each year of operation for considerable lengths of time, in some years as much as four or five months.

#### VALUE OF INLAND WATERWAYS.

The Master comments upon the value of inland water transportation on the Mississippi as an offset to the serious handicap produced by the Panama Canal, in the way in which the latter has afforded cheap rates for transportation from the Atlantic to the Pacific coasts, which cannot be met by the railroads serving the interior portions of the country; and further commented upon the value of this navigation in reducing the cost of moving agricultural products from the Mississippi Valley to seaboard for transportation to the world markets where the price of these commodities is fixed, and states that it may be assumed that these matters are of national interest and points out that Congress has given elaborate consideration to them.

#### REMEDIAL WORKS WILL REGULATE LEVELS.

The Master quotes the several reports of Federal engineers, to the effect that remedial works in the outlet channels of the Great Lakes will more than restore the level lost by the Chicago diversion, particularly quoting those portions of the last report of the Joint Board of Engineers

of the United States and Canada, in which it was found that the entire cost of these remedial works would not exceed \$4,608,000.

#### CHICAGO'S SANITARY PROBLEMS.

In reference to Chicago's sanitary problem the following quotation from the report is of interest:

"It is plain that the present flow from Lake Michigan through the drainage canal could not be immediately cut off, or reduced to 1,000 c. f. s., and in consequence the sewage of the Sanitary District in its present condition turned into Lake Michigan, without exposing the inhabitants of the district to grave risk of water-borne diseases, by contamination of the water supply taken from the lake. The Chicago River and the waters of the lake about the city would be filthy and noisome, with serious injury to the commerce of Chicago harbor. It appears from the testimony that it would take several years, not less than five years and perhaps ten years, or even more, before the sewage of the district, with such treatment as is practicable, could be turned into the lake and the diversion from the lake stopped or greatly reduced, without serious risk to the health of the people of Chicago. If the work of sewage treatment is efficiently carried on, and is extended by the most approved methods, and additional and appropriate measures are taken for water purification, it appears to be possible largely to reduce or altogether to terminate the diversion from Lake Michigan, and still to give the city of Chicago a reasonable measure of immunity from disease through pollution of its water supply. Within what time this result could be achieved can not now be definitely determined.

#### QUESTIONS OF PUBLIC HEALTH INVOLVED.

"To secure the utmost practicable treatment of the sewage of the Sanitary District, and to reduce as rapidly as possible the diversion of water from Lake Michigan, without creating conditions which would seriously menace the health of Chicago, will require constant and expert administrative supervision, the continuous checking up of the results obtained by the installation of treatment works, and the insistence on such improved method as from time to time will be available. Apart from the question of authority, which will be considered later, I find upon the facts here shown that the recommendation of the chief of engineers, above set forth (referring to the conditions of the permit requiring the installation of sewage treatment) on the application for the permit of March 3, 1925, which under lay the conditions of that permit, was a reasonable one with respect to the measure immediately practicable.

"The complainants have recognized the impracticability of ordering an immediate cessation of the diversion, and the suggestion made in the closing argument on their behalf before the Special Master was that the court should determine the rights of the parties, and direct a discontinuance of the diversion, but should suspend the operation of the decree and hold it in the court with requirements from time to time as to the action, and the time, that should be taken to bring about a condition which would permit of the decree becoming effective."

#### QUESTIONS OF LAW INVOLVED.

In reference to the questions of law presented, the report defines these questions to be: Whether there is a justiciable controversy of which the Supreme Court could take jurisdiction; whether the State of Illinois had the right to divert the waters of Lake Michigan in the manner shown without the consent of the United States; whether Congress has the authority to control the diversion and to regulate it; and whether the Secretary of War, as the agent of Congress, had the authority to grant the permit of March 3, 1925, under the Act of 1899.



The report concludes that there was a justiciable controversy, in the light of previous decisions of the Supreme Court in controversies between states similar in nature to the one presented. The Master points out that the defendants, Illinois and Sanitary District, both stated in their answers in this case that they could not divert water and did not intend to divert water except by and with the authority of the United States, according to law. And the Master concludes that Illinois has no such authority without the action of Congress or its agent, the Secretary of War, in view of the preceding decision of the Supreme Court on the suit of the government to enjoin the Sanitary District from diverting more than the amount specified in the earlier permit of the Secretary of War.

#### CONGRESS CAN REGULATE DIVERSION.

As to the authority of Congress to regulate the diversion, the decision is conclusive, dealing as it does with every contention made by the complainants and basing its conclusion upon a wealth of authority. The decision is to the effect that, under the commerce clause of the Constitution, Congress can regulate navigation, and as this diversion has beyond question in fact an effect upon navigation, the entire matter falls within the scope of Congressional authority. The riparian rights of the complainant states in the waters of the Great Lakes and the lands under those waters are all, according to the decision, held subject to the exercise of the paramount power of Congress to control and regulate navigation, and any damage resulting from acts performed pursuant to such Congressional authority are merely incidental damage for which the law does not allow compensation.

As to the right to divert water from the Great Lakes into the Mississippi for the purpose of aiding navigation, the report says:

"If Congress decided that it was in the interest of the country as a whole to open and improve a waterway from Lake Michigan to the Mississippi River and the Gulf of Mexico, and for that purpose diverted water from Lake Michigan to the Mississippi watershed, there would seem to be no constitutional difficulty so far as the diversion is concerned. Its practicability, its amount, the effect on the Great Lakes-St. Lawrence watershed, and on the States bordering on the Great Lakes, the question where the balance of National interest lay after appropriate appraisal of all local interests and of international relations, would be matters for the consideration of Congress exercising the sovereign power of the nation in determining National policy."

The report holds that as a matter of fact Congress has not yet, in spite of many legislative enactments dealing with certain phases of this problem, finally authorized the diversion, but the decision is to the effect that by the Act of 1899 broad power to regulate matters of this kind was delegated to the Secretary of War, that this Act has been held to be constitutional and that the action of the Secretary in granting the permit of March 3, 1925, under which the diversion is now taking place, was within the lawful authority of the Secretary of War and was a reasonable exercise by him of that power.

## CANADIAN TREATY NO BAR TO DIVERSION.

In reference to the effect of the treaty with Canada of 1909, upon which frequently stress is laid in newspaper and other articles concerning this historic controversy, the decision of the report would seem to be final and conclusive. Under the Constitution of the United States, a treaty duly authorized and approved by the Senate becomes the law of the land and is, of course, binding upon Federal officers. If there were anything in the treaty which tended to limit the authority of the Secretary of War to deal with this diversion and authorize it, as he did by the existing permit, it would have been the bounden duty of the Master to so declare, and to the extent that the permit exceeded the limitation imposed by the treaty to declare it unlawful. The report says:

"It does not seem to be necessary to discuss the provision of the treaty of 1909, or the reservations it contains, and I express no opinion upon them, further than to say that the treaty contains nothing which can be regarded as affecting a repeal of the Act of March 3, 1899, or as operating to deprive the Secretary of War of the authority it conferred in relation to the diversion here in question."

## LAKE MICHIGAN A DOMESTIC WATER.

Among his findings of fact the Master quoted certain portions of the treaty, which show beyond dispute that Lake Michigan, being regarded as a domestic water of the United States and not an international water, was clearly excepted from the operation of the treaty. And the report quotes the statement of Secretary of State Elihu Root, as follows: "I have very carefully guarded the terms of this treaty in order not to include Lake Michigan."

In concluding these comments it is worth while to note that what appears to be one of the strongest reasons in the mind of the Special Master for his decision sustaining the authority of the Secretary of War, is his conclusion that the pollution of the Chicago harbor, which would result from a cessation of the diversion, materially concerned navigation and would produce a situation directly within the full scope of the Secretary of War's authority in this particular. The report says:

"In exercising his authority under the statute, it was incumbent upon the Secretary of War to consider the interests of navigation, but he was bound to consider those interests in relation to the Chicago River and the Chicago Harbor as well as in connection with the effect on other harbors and the levels of the lakes. \* \* \* It appeared that a diversion of 4,167 c. f. s. was not sufficient to keep the Chicago River reversed at all times, and when not kept reversed, the enormous volume of Chicago's sewage would pour into the lake and under present conditions could not fail to create a pestilential condition in the lake, and in the port and harbor of Chicago. The nature of the injury which would be sustained by the interests of navigation and commerce, and the propriety of the intervention of the United States, in such a case were pointed out by the (Supreme) court in *New York v. New Jersey*, 256 U. S. 296."

And in conclusion the report says:

"If Congress had no power to regulate the diversion, or if it lay outside the authority delegated to the Secretary of War, he could not deal with it



at all; but if Congress had the power, and the Secretary of War had the administrative authority to regulate the diversion, there seems to me to be no basis for a decision that he transcended his authority in determining the quantity allowed or that his action is subject to judicial review." \* \* \*

"The permit is in terms revocable at the will of the Secretary of War, and is subject to such action as may be taken by Congress. If not revoked, or extended, the permit is to expire on December 31, 1929. It seems to me that the Secretary of War had authority to impose these conditions." \* \* \*

#### SUMMARY OF CONCLUSIONS.

My conclusions are:

"1. That the complainants present a justiciable controversy.

"2. That the State of Illinois and the Sanitary District of Chicago have no authority to make or continue the diversion in question without the consent of the United States.

"3. That Congress has power to regulate the diversion, that is, to determine whether and to what extent it should be permitted.

"4. That Congress has not directly authorized the diversion in question.

"5. That Congress has conferred authority upon the Secretary of War to regulate the diversion, provided he acts in reasonable relation to the purpose of his delegated authority and not arbitrarily.

"6. That the permit of March 3, 1925, is valid and effective according to its terms, the entire control of the diversion remaining with Congress."

#### RECOMMENDATIONS FOR DECREE.

"In the light of these conclusions, the bill, in my opinion, should be dismissed. I think, however, that if a situation should develop in which the defendants were seeking to create or continue a withdrawal of water from Lake Michigan without the sanction of Congress or of administrative officers acting under its authority, the complainant States have such an interest as would entitle them to bring a bill to restrain such action.

"I therefore recommend that the bill be dismissed without prejudice to the right of the complainants to institute suit to prevent a diversion of water from Lake Michigan in case such diversion is made or attempted without authority of law."

The Supreme Court of the United States has so far failed to take any public action with regard to the report of its Special Master. If the court sustains the decision of Judge Hughes the diversion may be continued as long as the same is authorized, whether by direct Congressional action or by permit from the Secretary of War.

It seems reasonable to conclude that if the Illinois Waterway is promptly completed and water-borne commerce becomes thoroughly established, a sufficient diversion may be continued to provide for the needs of navigation.

#### ILLINOIS VALLEY FLOOD CONTROL COMMISSION.

The Fifty-fifth General Assembly provided for the creation of the Illinois Valley Flood Control Commission "for the purpose of studying the causes of floods, conferring and cooperating with other bodies or agencies and providing means for flood control in the Illinois River Valley."

Under the terms of this Act, the writer and Stillman J. Stanard, Director of Agriculture, are, *ex officio*, members of said commission. The members appointed by the Governor are:

Senator Andrew S. Cuthbertson, of Bunker Hill, Chairman ;  
Representative H. V. Teel, of Rushville, and  
Archie T. Dunn, of Beardstown, Secretary, a "citizen residing in the Illinois Valley region."

The first meeting of this Commission was held at Springfield, December 21, 1927, at which time the writer presented maps and profiles and reports from the Division of Waterways, together with records showing the general condition of the Illinois River Valley and descriptions of the recent floods therein which led to the creation of the Commission by the action of the General Assembly.

The engineers of the Division of Waterways have from time to time furnished to the Commission information on engineering features of the Illinois Valley particularly from the matter being prepared for a special report of the Division regarding flood control, which is to be published as soon as completed.

### THE DIVISION AND THE DENISON-DENEEN BILL.

In response to a letter from Hon. Charles S. Deneen, United States Senator from Illinois, dated January 30, 1928, asking for data regarding the Illinois section of the Lakes-to-Gulf-Deep-Waterway; the importance of extending the Federal Barge Line service to the Illinois River and the Hennepin Canal (Illinois and Mississippi); and damage by floods to the lands of our State in the Mississippi, Illinois and Ohio River bottoms, this office, under date of February 6, 1928, furnished the Senator a manuscript copy of a report by the Supervisor regarding "Floods in Illinois," filed November 7, 1927, by Governor Len Small, with the Flood Control Committee of the House of Representatives of the Congress of the United States. At the same time there was submitted a copy of Governor Small's address before the committee, and copies of engineering suggestions by Mr. M. G. Barnes, then Chief Engineer, and by Mr. L. D. Cornish, Assistant Chief Engineer, who was in charge of emergency flood relief work for the State, under Senate Bill 576 of the Illinois General Assembly. The data referred to are included in this report at pages 26 to 40 inclusive.

#### BRENT'S REPORT IN AID OF THE AMENDMENT.

Under date of February 25, 1928, there was furnished to Senator C. S. Deneen an original manuscript copy of a special report regarding extension of the Federal Barge Line service to the Illinois River and Hennepin Canal as proposed in a bill introduced in the United States Senate by Senator Deneen.

This report, prepared by Mr. Theodore Brent, former traffic manager of the Federal Barge Line, and now engaged as transportation expert and terminal consultant for the Division of Waterways, was substantially as follows:



MEMORANDUM CONCERNING EXTENSION OF SERVICE OF THE FEDERAL BARGE LINE TO THE ILLINOIS RIVER AND HENNEPIN CANAL, AS PROPOSED IN BILL INTRODUCED BY SENATOR CHARLES S. DENEEN.

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Prepared for the Use of  
HONORABLE WM. F. MULVIHILL, SUPERVISOR  
ILLINOIS WATERWAY CONSTRUCTION.

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By THEODORE BRENT.

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*February 23, 1928.*

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The proposal, embodied in the bill introduced in the Senate by Senator Charles S. Deneen, is to direct the Secretary of War to extend the government service of common carriage now being operated on the Mississippi River to include the Illinois River and the Hennepin Canal.

There is appended to this report, as *Exhibit A*, a map showing the extent of existing services of the Federal Barge Line on the Mississippi River. Included in this exhibit is a forecast of the proposed service on the Illinois River and Hennepin Canal as it will doubtless work out in practice.

THE ILLINOIS RIVER.

This stream is now commercially navigable for craft drawing seven feet of water from its point of junction with the Mississippi River, near Grafton, to Utica, Illinois, a distance of 224 miles.

Before the introduction into this stream of the 8,500 cubic second feet of water from Lake Michigan which it now receives through the Chicago Drainage Canal and the DesPlaines River, the navigable depth required for craft of that earlier time was secured by the introduction of four locks and dams. Of these the State of Illinois built two, one at Henry and the other at Copperas Creek. Later the Federal government built two dams with larger locks below Peoria, one at Kampsville and the other at LaGrange.

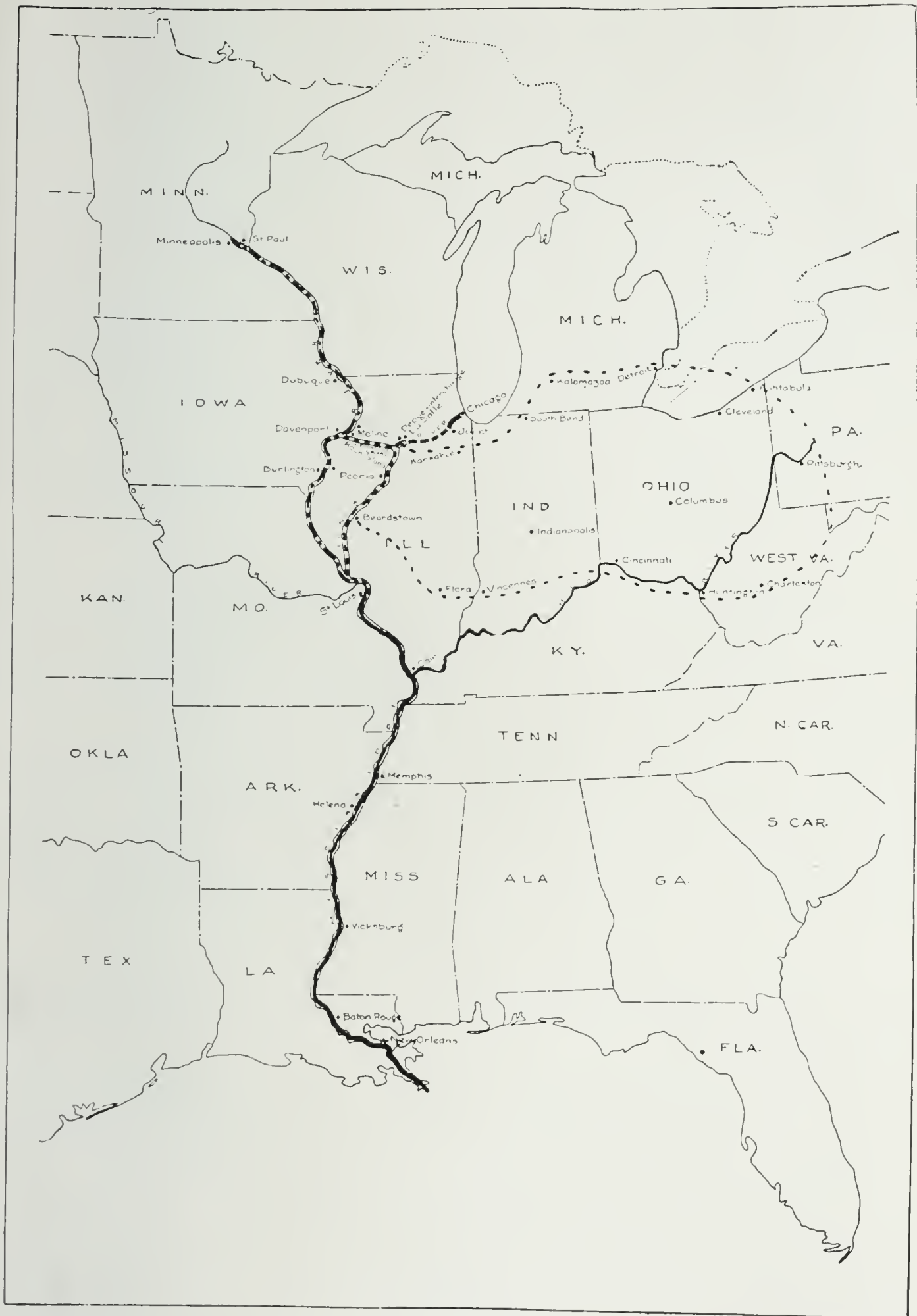
Under present circumstances the required depth to float barges drawing seven feet of water can be secured with free flow of the existing minimum run-off above Peoria. Consequently the State has ceded to the Federal government the sites of the Henry and Copperas Creek dams. These two impediments will be partially destroyed this season by the United States Engineers, so as to admit of free passage around the small State locks.

The two Federal locks at Kampsville and LaGrange are, under the present engineering plan, to be retained until the nine foot project is fully out.

The five new locks of the Illinois Waterway are being built to the standard dimensions for all government projects of nine foot depth, namely 110 by 600 feet. The dimensions of the Federal locks at Kampsville and LaGrange are but 75 by 350 feet. While this limitation of dimensions forms an impediment to the working out of the great standardized scheme for the Mississippi Water Trunk Line and the cost and inconvenience of operation will unquestionably become serious when navigation takes on large proportions, these two locks do not constitute an insuperable obstacle to the immediate extension of the existing services of the Federal Barge Line to include this stream.

THE HENNEPIN CANAL.

This is a Federal project completed some forty years ago. It forms a short water transportation link between the Illinois and Mississippi Rivers. Forming a junction with the Illinois River at the point where that stream, after having traversed half the width of the State in a generally westerly direction from Chicago, turns sharply south, this canal pursues a course due west on nearly an air line to a connection with the Mississippi River at the



"Exhibit A," showing extent of "lower" and "upper" river services of the Federal Barge line on the Mississippi River. The dotted line shows feasible extension of lower river services.



mouth of the Rock River, just south of Rock Island. With the unfinished Illinois Waterway, this provides a water link between Chicago and the upper Mississippi River only 186 miles long, as contrasted with the Rock Island railroad between the same points of 181 miles, and the short line rail distance of the Northwestern railroad of 138 miles between Chicago and the Mississippi River at Clinton, Iowa.

Exhibit B is a map and profile of the Hennepin Canal.

Leaving the level of the Illinois River at Bureau, the canal rises rapidly to the level of the high tableland which constitutes the area of the State between the Illinois and Rock River Valleys. In the first twenty miles there are 21 locks which lift the barges to a height of 199 feet above the level of the Illinois. From this point to the junction with Rock River at Lock 29—62 miles from Bureau—there are long stretches of pool water through which barges can move rapidly and steadily. From Lock 29 on to the junction with the Mississippi just below Rock Island, a distance of 75 miles from Bureau, the canal either merges with or is carried beside Rock River. There is a total descent of 93 feet from the summit to the level of the Mississippi. There are 31 locks in all. They have 35 x 170 feet clearance, with a navigable depth of 7 feet over the mitre-sills at standard stage. Bridges have 17 feet clearance above the water at standard stage.

It will take about eighteen hours to move barges through the Hennepin Canal between Bureau and Rock Island.

#### OPERATION.

In the map constituting Exhibit A, the operation designated as the Lower Mississippi River Section is shown in solid black and that of the Upper River Section in parallel lines. A dotted line has been included to indicate the feasible extension of the Lower River service beyond St. Louis up the Illinois to Peoria. Likewise the operation of the Upper River Section has been extended through the Hennepin Canal and down the Illinois to Peoria, as indicated.

Peoria, as the largest city and the greatest point of interchange with the railroads upon the Illinois River, is the most logical point of beginning and termination of the two services. For the purpose of serving its existing traffic, if the Lower River service is to be extended to some point farther north than St. Louis, it must come to Peoria. For like reasons, the Upper River service must have access to the railroad interchange at Peoria, if its service is to be extended east of Rock Island through the Hennepin Canal.

#### LOWER RIVER BARGES CARRY 2,000 TONS.

The standard barges of the Lower River service are 45 by 230 feet and carry 2,000 tons deadweight on eight feet draft. These barges can be profitably operated up the Illinois to Peoria or LaSalle. They cannot go through the Hennepin Canal.

The standard barges of the Upper Mississippi River Section are 33 by 130 feet and will carry 500 tons on 6 feet draft. These barges were especially designed of dimensions permitting their passage through the Hennepin Canal.

In the Mississippi River below Cairo the Federal Barge Line moves with standard tows of six 2,000-ton barges. The power boats of the line draw 8 feet and are very successful in that reach of the river. The line has no power boats suitable for the river between Cairo and St. Louis. Service between these two terminals has never been what it should be and the costs of operation in that reach of the river have been inordinate by reason of lack of proper power boats. Additional power boats would have to be built to serve on the Illinois River. They should be of substantially 1,500 indicated horsepower, built to dimensions which will carry economical propelling machinery of this power on not in excess of 6 feet draft.

These tow boats could successfully move tows of three of the standard 45 by 230 foot barges in regular schedules between St. Louis and Peoria, interchanging the barges at the former point with the towboats of the Lower Mississippi River Section.





STATE OF ILLINOIS  
DEPARTMENT OF PURCHASES AND CONSTRUCTION  
DIVISION OF WATERWAYS

COPIED FROM MAP DRAWN UNDER  
DIRECTION OF MAJOR C. S. RICHE  
CORPS OF ENGINEERS U.S.A. PUBLISHED FOR THE BENEFIT OF OWNERS AND NAVIGATORS OF COMMERCIAL AND PLEASURE CRAFT IN ILLINOIS BY THE RIVERS AND LAKES COMMISSION



"Exhibit B," map and profile of the Hennepin (Illinois and Mississippi) Canal.

UPPER RIVER SECTION.

The barges of the Upper River Section would have to move in single formation through the Hennepin Canal to a mooring at its junction with the Illinois River at Bureau. One of these loaded barges can easily be pushed through the canal by a gasoline launch manned by not in excess of three men. Launches would have to be provided of dimensions which would permit the launch and a single barge to be accommodated at one lockage. With thirty-one locks to be negotiated, this would be the only feasible method of operation.

Service in the 60-mile reach of the river, between Peoria and LaSalle could probably best be handled by a towboat of the Illinois River type which could take both Upper and Lower River barges to local terminals at Peru and LaSalle, and to a possible interchange with the C., M., St. P. & P. and New York Central Railroads in the vicinity of DePue. This boat could also move the Upper River barges between the terminus at Peoria and the Canal, mooring near Bureau. This power boat would be necessary owing to the fact that gasoline launches which would successfully push loaded barges through the slack waters of the Hennepin Canal could not make headway against the current of the Illinois River.

TRAFFIC—LOWER MISSISSIPPI SECTION.

Peoria, LaSalle and Peru are the principal manufacturing and distributing cities on the portion of the Illinois River which is presently navigable. These cities are today shipping much of their traffic by way of the Federal Barge Line through St. Louis and Cairo into the Lower Mississippi Valley, the Southwest and the Pacific Coast, together with their exports. The three cities mentioned ship all kinds of steel products, zinc and lead products, binder twine, implements, alcohol, glucose and corn products. The water-borne tonnage would be greatly increased were there direct barge service from them in place of rail-and-water service such as there is today.

On traffic moving from Peoria at present to the states of Arkansas and Oklahoma, the Lower Mississippi Section receives the freight from the railroads at St. Louis and re-delivers it to its rail connections at Memphis. We list below the savings which accrue to Peoria shippers or their consignees on this present traffic, and the increased savings which will accrue when there is direct water service from Peoria, LaSalle and Peru.

SAVINGS TO PEORIA WATER SHIPPERS.

	Iron and steel products.	Pig lead and zinc.	Binder twine.	Imple- ments.	Alcohol.	Glucose.	Cereal products.
Present differentials (in cents per 100 pounds)-----	4.5	6	10.5	9	7.5	5	6c
Savings with through service from Illinois River-----	7.5	7.5	12.	12	14.5	7.5	7c
Increased saving to public	3 (Or 60c per ton.)	1.5 (Or 30c per ton.)	1.5 (Or 30c per ton.)	3 (Or 60c per ton.)	7 (Or \$1.40 per ton.)	2.5 (Or 50c per ton.)	1c (Or 20c per ton.)

This would mean, for example, that on each car of steel products shipped from or through Peoria to Memphis or through Memphis into Arkansas or Oklahoma there would be an additional saving to the public of \$25.00 per car by reason of the extension of the barge service up the Illinois to the present head of navigation.

There is today rail-barge-and-rail service from Peoria, by rail to St. Louis, barge to Vicksburg, and thence by rail into northern Louisiana and Texas. Immediately below we list present and approximate new differentials on this traffic from Peoria, LaSalle and Peru, together with the increased saving to the public immediately resulting from the extension of the Lower River service up the Illinois.



## INCREASED BENEFITS OF EXTENSION OF SERVICE.

	Iron and steel products.	Pig lead and zinc.	Binder twine.	Imple- ments.	Alcohol.	Glucose.	Cereal products.
Present differentials (in cents per 100 pounds)-----	6	7.5	13.5	11.5	15	6.5	7.5
Savings with through service from Illinois River-----	9	9	14	15	18.5	9	9
Increased saving to public	3 (Or 60c per ton.)	1.5 (Or 30c per ton.)	.5 (Or 10c per ton.)	3.5 (Or 70c per ton.)	2.5 (Or 50c per ton.)	2.5 (Or 50c per ton.)	1.5 (Or 30c per ton.)

Through New Orleans there are rail connections into all south Louisiana and Texas; there are steamship connections to Mobile and Pensacola and to the entire Pacific Coast. There are also regular steamship lines taking the exports of the country to all sections of the world.

The present and prospective differentials and the increased savings to Illinois industries on traffic to and through New Orleans resulting from the proposed extension of service up the Illinois are shown below.

## PRESENT AND PROSPECTIVE DIFFERENTIALS.

	Iron and steel products.	Pig lead and zinc.	Binder twine.	Imple- ments.	Alcohol.	Glucose.	Cereal products.
Present differentials-----	5.5	8	14.5	12.5	17	7	9
Savings with through service from Illinois River-----	10.5	9.5	16.5	17	17.5	10	10
Increased saving to public	5 (Or \$1.00 per ton.)	1.5 (Or 30c per ton.)	2 (Or 40c per ton.)	4.5 (Or 90c per ton.)	.5 (Or 10c per ton.)	3 (Or 60c per ton.)	1 (Or 20c per ton.)

## MATERIAL SAVINGS TO ILLINOIS INDUSTRY.

The extension of the service consequently offers to Illinois industries on their manufactured products additional savings ranging from 10 cents to \$1.40 per ton. The opportunity which these savings, coupled with the advantage of direct water service, offer to the merchants of these cities as a means of expanding their markets in the whole South and Southwest and upon the Pacific Coast is very great.

The Southwest is already a great distributing market for Illinois industries. In that territory many of the savings can be converted directly into profits. In the export and Pacific Coast trade the Atlantic seaboard today has marked advantages in all-water rates. Every cent saved to Illinois manufacturers in freight costs to these highly competitive markets gives an added opportunity for profitable distribution and in many instances makes possible entrance into valuable competitive fields of distribution which are today closed to them by high freight costs.

Chicago, Rockford, Freeport, Joliet, Aurora, Elgin and all the other manufacturing cities and towns of northern Illinois would, through the system of joint rates already approved, be accorded the same savings as above listed from Peoria when the service of the Federal Barge Line can be extended up the Illinois so that the joint rates now effective through St. Louis may be established through Peoria and reflect the additional savings accruing through this 200 miles of additional water haul. The traffic affected and which can be attracted by these additional aids to distribution amounts to hundreds of thousands of tons annually.

## MANUFACTURERS AND MERCHANTS HELPED.

The merchants of this same territory sell and distribute large quantities of southern products such as sugar, rice and molasses. They import much coffee and sisal. They buy large quantities of canned fruits from California, pineapple from Hawaii, salmon from the North Pacific Coast. All these commodities are brought by water to New Orleans and thence inward by barge. The added differentials accruing to the public on these commodities when distributed through Peoria by reason of the added water haul above St. Louis will range from 20 to 25 cents per ton.

In 1927 the merchants of Illinois and Wisconsin distributed approximately 5,000 carloads of sugar which moved north by barge into northern Illinois, Wisconsin, Minnesota, Michigan and northern Iowa, which will distribute naturally through Peoria when the service is extended up the Illinois.

## LARGE VOLUME OF TRAFFIC.

This traffic amounted to approximately 150,000 tons and the saving to the public from the longer water haul to Peoria will be not less than \$30,000.00 on this item alone.

The yearly importation of coffee through New Orleans is in excess of 2,500,000 bags. At least one-third of this traffic moves to territory which, if shipped by barge, will distribute naturally through Peoria.

Of the annual importation of some 250,000 bales of sisal, the major portion is consumed at Chicago, Peoria, St. Paul, Stillwater, Waupun, Wis., and Jackson, Mich. All of this traffic will seek water transportation if barges are provided and all of it will move through Peoria, except that for St. Paul and Stillwater, which latter traffic will move by water all the way.

## UPPER MISSISSIPPI RIVER SECTION.

Peoria today can only reach the Twin Cities of Minneapolis and St. Paul through the Upper River by way of the rail lines through Dubuque. Peoria merchants and manufacturers, as well as all of the Illinois industrial area which would reach the river through that port, do a very large business with the dealers and distributors of the Twin Cities. The jobbing houses and brokers of St. Paul and Minneapolis control the bulk of the trade of the states of Minnesota, the Dakotas and Montana. They buy in carloads from Illinois and the Lake States, for which Peoria is the gateway, much of the merchandise which they job in the Northwest.

The present comparison of class rates from Peoria to the Twin Cities is:

Classes.	1	2	3	4	5	A	B	C	D	E
All-rail.....	98	83.5	68.5	49	34.5	39	32	27.5	22	19.5
Rail and barge through Dubuque....	84.5	72	59	42.5	30	33.5	27.5	24	20	-----
Barge saving.....	13.5	11.5	9.5	6.5	4.5	5.5	4.5	3.5	2	-----

## A UNIFORM DIFFERENTIAL OF 20 PER CENT.

The Commission, on account of some glaring inconsistencies in the railroad rate adjustments, only required the railroads to join the Upper River Section in through rates via Dubuque carrying a differential of 15 per cent under the all-rail figures. The uniform differential through all Lower River ports is 20 per cent, and that is the basis the Barge Line desired to establish.

With an all-water service between Peoria and the Twin Cities the differential will unquestionably be made 20 per cent, as that is the basis used between all the cities on the Upper River which now have the benefit of all-water service.

Such relief will be timely and greatly appreciated by all Illinois merchants and manufacturers. The railroads in cases now pending before the Commission are asking very marked increases in their class rates. Presuming that they are granted, and the Upper River Section is permitted to extend its service through to Peoria, the comparison will be as follows:



Classes.	1	2	3	4	5	A	B	C	D	E
Proposed all-rail.....	135	115	95	81	54	61	47	41	34	23
All-water.....	108	92	76	65	43	49	38	33	27	18
Water differentials.....	27	23	19	16	11	12	9	8	7	5
Present rail and water differentials ..	13.5	11.5	9.5	6.5	4.5	5.5	4.5	5.5	2.5	0
Increased saving by extension to Peoria.....	13.5	11.5	9.5	9.5	6.5	6.5	4.5	4.5	4.5	5

## EXTENSION OF SERVICE WILL DOUBLE DIFFERENTIALS.

In other words, the extension of Upper River service through the Hennepin Canal will enable existing differentials under proposed higher rail rates, to be doubled or more than doubled.

As explained in the case of the Lower River Line, these savings will not be confined to the cities on the bank of the Illinois River, but will be reflected in the through rates which will be constructed with diverging railroads under opinions already rendered by the Interstate Commerce Commission and upon which a very large basis of joint rates is already established.

Upon the map which constitutes Exhibit A there is a line drawn from DePue and Beardstown, Ill., on the Illinois River and encircling a large portion of Illinois and Indiana, all of Ohio and portions of southern Michigan, western Pennsylvania and West Virginia. This constitutes the bulk of what in railroad parlance is known as Central Freight Association Territory.

## JOINT RAIL AND WATER RATES.

The railroads which dominate this large area have their principal Western termini at Chicago, Peoria and St. Louis. They none of them touch the Mississippi River at any point north of St. Louis. They all of them touch the Illinois River at Peoria, DePue and Beardstown.

By reason of this geographical situation there are no joint rates today from this productive territory to the Twin Cities of Minneapolis and St. Paul in connection with the Upper Mississippi River Barge Line, except from points on the Illinois Central Railroad. It will never be possible to establish such rates through St. Louis from the major portion of this territory, for this would require the carrying of the business by long routes both by rail and water around two sides of a triangle and the rule of circuitry established by the Commission prohibits it.

The same rule invoked in connection with the Upper River service extended through the Hennepin Canal to DePue, Peoria and Beardstown would permit the establishment of a full line of rates on all classes and commodities to St. Paul and Minneapolis.

This area manufactures a very large portion of the traffic which is consumed and distributed at the Twin Cities. From this area and from the Chicago District (which already has joint rail and barge rates through DuBuque) there is received every day at the Twin Cities in package cars 150,000 pounds of less carload merchandise. The bulk of merchandise is rates first, second and third class. The public saving on this class of merchandise moved all-water from Peoria to the Twin Cities can be conservatively placed at 20 cents per 100 pounds or \$4.00 per ton.

## POSSIBLE SAVINGS ON COMMODITIES LISTED.

We list below the tonnages of a number of important groups of commodities received in the Twin Cities in the calendar year 1927. The traffic largely originated in the Central Freight Association Territory and the Chicago District. The savings afforded by the joint rates through Illinois River gateways, as here listed, would naturally deflect a very substantial share of this tonnage to the rail and water routes.

	Tons.	Anticipated savings per ton.
Agricultural implements, vehicles.....	90,303	1.35
Automobiles and trucks.....	79,543	1.75
Furniture.....	21,930	1.75
Iron and steel products.....	433,559	1.00
Machinery, boilers.....	35,351	1.10
Miscellaneous.....	678,200	1.50

In the reverse direction, the Upper Mississippi Section would bring to Peoria principally flour. There is annually ground at Minneapolis and distributed into the Central Freight Territory, in excess of 4,000,000 barrels of flour of an average weight of 200 pounds. The proportional rail rate on flour from the Twin Cities to Peoria is 13 cents per 100 pounds. The water line would be authorized under the standard 80 per cent basis to carry an all-water rate of 10 cents per 100 pounds, and could afford to do so. This would be a saving to the public of 6 cents per barrel. If the whole movement came down by water, this would offer an annual public saving on this commodity alone of \$240,000.

#### EXTENSION OF THE SERVICE—FACILITIES LACKING.

All the authorized capital of the Inland Waterways Corporation is expended or under contract. The corporation has not today nearly enough facilities and equipment to provide the needed transportation on the Upper or Lower Mississippi or the Warrior River.

The power boats are unsuited to this service. There are no barges to spare. The death of equipment and facilities and the unsatisfactory conditions resulting from existing lack of capital are very clearly set out in a statement presented last October to the Secretary of War by the Barge Line Users Special Committee. On this subject the committee said, in part:

"The line is, therefore, not, in any sense, serving the public as Congress intended it should, but is of special and doubtful benefit only to those who may be contented with the allocation of limited space and uncertain schedules. The management has thus been forced to discriminate against shippers to the extent of forcing certain commodities off the line entirely. These deficiencies in equipment and service have been allowed to accumulate for years, and must inevitably, unless promptly remedied, defeat the very object of Congress in the establishment of this transportation system."

#### REQUIRED ADDITIONAL GOVERNMENT INVESTMENT.

A Congressional direction to the Secretary of War to extend the service of the Federal Barge Line to the Illinois River and the Hennepin Canal implies and requires a Congressional authority to increase the existing capital stock of the Inland Waterways Corporation sufficiently to permit of the expenditure necessary to put the Congressional mandate into operation. It also requires the actual sale to the Federal Government of this additional capital stock and an appropriation sufficient to buy it at par.

The present capital of \$5,000,000.00 is of little significance. The corporation is the repository of some \$20,000,000.00 of Government property dedicated by Congressional enactment to the operation and development of common carrier services. These services Congress has directed the Secretary of War to continue "to the point where they may be disposed of to private capital to the best advantage of the Government."

#### ADDITIONAL EQUIPMENT REQUIRED.

In order to form simply the beginning of a service which will do no more than provide an extension to Peoria of the services of the Upper and Lower Mississippi Sections so as to synchronize with existing services on those streams there will be required:



*For Lower River Section:*

Three towboats, \$250,000 each.....	\$ 750,000.00
Twenty barges, \$70,000 each.....	1,400,000.00

*For Upper River Section:*

Twenty barges, \$20,000 each.....	400,000.00
Five power launches, \$3,000 each.....	15,000.00
Moorings at Bureau and Rock Island.....	20,000.00

Total.....	\$2,585,000.00
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This takes no account of the matter of terminals, presupposing that these will be provided by the communities. This, it is hoped, will be realized at Peoria. However, needed interchanges with vital rail connections at Beardstown and DePue are not here provided for and there is little probability that these communities will be able to provide them. The actual capital appropriation for this extension of service would more wisely be rounded out to \$3,000,000.00, so as to allow a safe margin either for direct construction of these interchanges by the corporation or for loans to these communities for such construction, as authorized by section 201 of the Transportation Act of 1920.

## CONGRESS VOTES ADDITIONAL CAPITAL.

Congress not only authorized the Secretary of War to extend the Federal Barge Line service, but also voted to increase the capital stock of the Inland Waterways Corporation, which operates the barge line, from \$5,000,000 to \$15,000,000, in order to permit the program for the extension to be speedily carried out.

## CHIEF ENGINEER BARNES RESIGNS.

Because of his continued ill-health. Mr. Mortimer G. Barnes, Chief Engineer of the Division since November 1, 1917, found it necessary to ask to be relieved of the duties and responsibilities of that position, effective May 1, 1928.

Although physically unable to meet the exacting demands of the work as Chief Engineer, Mr. Barnes felt himself able to continue in the service of the Division in a consulting capacity and a mutually satisfactory and advantageous arrangement was made accordingly.

Following Mr. Barnes' resignation Mr. Lorenzo D. Cornish, Assistant Chief Engineer of the Division since 1920, was promoted to the position of Chief Engineer, for which he is admirably equipped by education and experience. Mr. Walter M. Smith, Sr., for many years Chief Designing Engineer, was made Assistant Chief Engineer.

## THE QUALIFICATIONS OF MR. CORNISH.

Mr. L. D. Cornish, the new Chief Engineer, graduated June, 1902, from Syracuse University with the degree of C. E. His titles, occupations, engagements have been as follows:

From June, 1899, to September, 1902, general engineering work on the design and construction of sewage and water supply systems and the location and construction of railroads. Instrument man.

From September, 1902, to September, 1906, Pittsburg and vicinity—U. S. Jr. Civ. Engr. and Supt. of Construction—Design and construction of locks and dams on the Ohio River.

From October, 1905, to February, 1909, Assistant Engr., Washington, D. C.—Assisting The International Consulting Board on designs and estimates for various proposed plans for Panama Canal.

From September, 1906, to June, 1907, Assistant Engineer, Isthmian Canal Commission, Washington, D. C.—Designs for Panama Canal Locks and Dams.

From June, 1907, to August, 1913, Panama Canal Zone—Designing Engineer, Isthmian Canal Commission, in charge of the design and the inspection of construction of all Panama Canal Locks exclusive of miter gates, machinery and protective devices, also consulting and reviewing engineer for the design of these excluded items.

From June, 1914, to November, 1914, Shanghai, China and vicinity—Principal Asst. Engr. to the American National Red Cross Board of Engineers appointed to investigate and report upon the Huai River Conservancy Project in China—In charge of field work, estimates, etc.

From March, 1915, to June, 1917, Cincinnati, Ohio—Prin. U. S. Asst. Engr.—Central Division, U. S. Engr. Dept. Designs and Inspection for the Division Engr. of improvements on the Ohio River and its tributaries.

From June, 1917, to November, 1919, Capt. and Major of Engrs. U. S. A. in charge of construction work in France for two years and on railroad organization work in the U. S. from July to November, 1919.

From November, 1919, to June, 1920, Designing Engineer—Division of Waterways, State of Illinois.

From June, 1920, to May, 1928, Asst. Chief Engr.—Division of Waterways, Dept. Purchases and Construction, State of Illinois—Designs, Plans and Construction of The Illinois Waterway to connect the Great Lakes with the Mississippi River.

From June, 1927, to May, 1928, Acting Chief Engr.—Acting Chief Engr., Illinois Division of Waterways in charge of levee construction in Illinois on Mississippi River, and rivers of Illinois.

May, 1928, Chief Engineer, Division of Waterways, State of Illinois. In engineering charge of location, design and construction of navigable waterways, levees, flood control projects, etc., within and for the State of Illinois, including The Illinois Waterway link of Lakes-to-Gulf-Waterway.

## ENGINEERING REPORT.

By L. D. CORNISH, *Chief Engineer.*

The fiscal year, 1927-28, is conspicuous for the marked increase in the activities of the engineering department. Flood relief acts passed on the closing day of June necessitated the immediate creation of a new organization to carry on the work provided for, which contemplated the expenditure for Flood Relief only, of approximately \$1,896,000, an amount greater than the expenditure for all purposes of the entire Division of Waterways for any preceding fiscal year. Then, in January, 1928, the dynamic urge for action of the Supervisor of Illinois Waterway Construction expressed itself in his announcement of April 1, 1931, as the schedule date for completion of The Illinois Waterway. This necessitated an immediate increase in the designing force, in order that plans and specifications might be rushed to completion, so that new work could be advertised and contracts awarded as rapidly as possible. This added activity is indicated by the increase in the designing division. Eight men, during the preceding year, performed 2,630 man days of work for an aggregate salary of \$2,000 per month, whereas, at the close of this year this force had been augmented to 17 men at an aggregate salary of \$4,600 per month, who accomplished 4,493 man days of work.

Also in order to promote a greater personal interest in their work and to increase their efficiency and knowledge of the requirements of design and construction by personal inspection of lock and dam structures in all stages of completion, all members of the designing force, accompanied by the Chief Designing Engineer, were directed to visit and inspect as soon as possible all construction jobs.

### GREAT INCREASE IN VOLUME OF WORK.

The Chicago office started, during the fiscal year, the following construction:



Description—	Estimated cost.
Flood Relief (S. B. 576).....	\$ 912,313.23
Beardstown Levee and Sea Walls.....	396,000.00
Brandon Road Lock, Dam and Retaining Walls.....	4,100,000.00
Starved Rock Lock and Dam Metal Work.....	480,000.00
Cement for Brandon Road, etc.....	950,000.00
Raising Valley Road near Ottawa.....	18,500.00
Aux Sable Aqueduct—I. & M. Canal.....	17,007.03
Gum Creek Culvert—I. & M. Canal.....	17,000.00
Painting LaSalle Aqueduct.....	3,909.41
Dredging at Spring Bay.....	2,857.92
Repairs to I. & M. Canal Banks.....	19,495.47
McHenry Dam—Fox River.....	4,803.55
Meyer's Bay Bridge, Fox Lake.....	14,168.00
Total.....	\$6,936,054.61

This total of work placed under construction for this fiscal year, exceeds the total expenditures during the previous ten years of existence of the Division of Waterways.

#### DETAIL REPORTS ON SEVERAL PROJECTS.

The canvass of bids received for the Beardstown levees and sea walls appears on page 61, and for Contract No. 7, metal work for Starved Rock lock and dam, on page 76.

Plans and specifications were revised and completed ready for printing and advertisement for Contract 3, construction of Dresden Island lock and dam; No. 7 for Starved Rock metal work; No. 8 for machinery of all locks; No. 9 for Marseilles canal and dredging of Starved Rock, Marseilles and Dresden Island pools; No. 10 for all remaining lock gates and valves, Brandon Road and Dresden Island; and No. 11 for Brandon Road and Marseilles bridges; also three bridges in Joliet. A more extended discussion of designing activities is furnished in the report of Walter M. Smith, Chief Designing Engineer, on page 74.

The increase in field activities kept pace with the designing and administrative activities of the Chicago office, owing principally to the commencement, in November, 1927, of the construction of the Brandon Road Lock and Dam, Joliet retaining walls and the utilities tunnel, under the DesPlaines River, by the direct employment of labor, materials and equipment, and constructional direction by contract for personal services of superintendents. This work is by far the largest, most difficult and costly of any work on the Waterway, and constituted the principal work of the Joliet Division. A more extensive description of this, and the other work under his charge, may be found in the report of R. S. Heath, Division Engineer, on page 78.

Construction work in charge of the Ottawa office progressed at a very satisfactory rate during the fiscal year. On Contract No. 2, for the Starved Rock Lock and Dam, 49,000 cubic yards of concrete were placed in the lock in five working months, which constitutes a record for Illinois Waterway work.

Erection of the miter gates for the Starved Rock Lock under Contract No. 7, was started May 28, 1928, and the raising of the Valley Road west of Ottawa was completed during the year.

Several construction jobs, required for repair and maintenance of the Illinois and Michigan Canal, were completed under the engineering direction of the Ottawa office.

CONTRACT FOR BEARDSTOWN LEVEE AND SEA WALL—CANVASS OF BIDS RECEIVED MAY 25, 1927.

Item number.	Item.	Unit.	Quantities.	McWilliams Dredging Co., 1537 McCormick Bldg., Ill.		James O. Heyworth, Inc., 606 So. Michigan Blvd., Chicago, Ill.		B. Layton, 213 Hershey Bank Bldg., Muscatine, Iowa.		Byrne Bros. Con- struction Co., Inc., 624 So. Michigan Blvd., Chicago, Ill.		States Corporation, 38 So. Dearborn St., Chicago, Ill.		Kochlitzky & Prosser Cape Girardeau, Mo.	
				Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.
A	Clearing for embankment	Lump sum	1	\$4,000 00	\$ 4,000 00					\$9,280 00	\$ 9,280 00	\$15,000 00	\$ 15,000 00	\$ 5,000 00	\$ 5,000 00
B	Embankment	Cu. yd.	450,000	26½	119,250 00	No bid	No bid			25	112,500 00	24	108,000 00	32	144,000 00
C	Cofferdams, pumping, bailing, etc.	Lump sum				\$22,500 00	\$ 22,500 00	\$37,500 00	\$ 37,500 00	56,169 30	56,169 30	87,909 00	87,900 00	10,000 00	10,000 00
D	Excavation for concrete walls	Cu. yd.	11,000			1 00	11,000 00	2 00	22,000 00	67	7,370 00	2 00	22,000 00	1 00	11,000 00
E	Concrete	Cu. yd.	10,000			10 00	100,000 00	10 25	102,500 00	10 32	103,200 00	12 90	129,000 00	21 00	210,000 00
F	Metal reinforcement	Pound	25,000			20	5,000 00	05	1,250 00	50½	1,375 00	05½	1,375 00	06	1,500 00
G	Foundation piles	Lineal ft.	30,000			75	22,500 00	75	22,500 00	85	25,500 00	95	28,500 00	1 00	30,000 00
H*	Timber sheet piling	1,000 ft. B. M.	120M	100 00	12,000 00					110 65	13,278 00	125 00	15,000 00	100 00	12,000 00
I	Backfill	Cu. yd.	22,000			60	13,200 00	50	11,000 00	28	6,160 00	1 00	22,000 00	80	17,600 00
J*	Stone paving	Sq. yd.	1,000	3 00	3,000 00					3 00	3,000 00	2 00	2,000 00	3 00	3,000 00
K*	Vitrified pipe, 6 in. diameter	Lineal ft.	1,000	50	500 00					1 00	1,000 00	50	500 00	20	200 00
	Total				\$138,750 00		\$174,200 00		\$196,750 00		\$338,832 30		\$431,275 00		\$444,300 00

\* See footnote, page 12, of specifications.  
Contracts were awarded to the McWilliams Dredging Co. and James O. Heyworth, Inc., as their combined bids, \$312,950.00, was lowest for the entire work.



The work of the Ottawa office is quite fully covered in the report of Division Engineer, J. B. Bassett, on page 84 of this report.

#### STATE SUPERVISION OF STREAM POLLUTION.

In addition to its other duties, the Department of Purchases and Construction, Division of Waterways, has the responsibility of looking after the pollution of the streams and bodies of water in the State of Illinois. In connection with this work the Division has naturally accumulated considerable evidence to substantiate the desirability of, and the necessity for, State supervision of streams and lakes as they may be affected by polluting substances. To the average layman, however, unless he is personally affected by some serious case of pollution, the matter of State supervision of streams and lakes may seem an unnecessary and unwarranted undertaking at the tax payers' expense.

The writer, while in China on flood relief work, spent some four months on boats traversing the shallow lakes, canals and streams of East China between Shanghai and Peking, and saw what is probably the world's worst case of stream pollution. The natural waters, while apparently clear, were so contaminated with disease germs that unless boiled or treated they could not be used by the white race for bathing or washing the inside of cabins. During the forty centuries of their historic existence the natives have become immune to disease from the external use of water, but even they, without exception, never use water as a beverage but always in the form of scalding hot tea.

Certain local conditions in Illinois are worse than the general conditions in China, and unceasing diligence on the part of all organized communities is necessary to improve local conditions and prevent the spread of contaminated water.

Considerable has been accomplished to date in this line of endeavor, even though at times corrective measures recommended and demanded have not been taken as rapidly as appeared desirable to the complainants. At best, even if the Department had the fullest legal powers to demand changes or entire new treatment works, the improvements would require considerable time. And naturally with the Departmental powers limited as at present, there are cases where undue delays, on the part of offending parties, occur. But our records indicate conclusively, that great progress has been made in clearing up the streams and bodies of water of the State. At present several of the larger cities which have not already done so, are providing sewage treatment plants. Several industries also, principally the gas plants, canning factories and milk plants are making necessary installations to reduce, if not fully remove, pollution. And with each new industry or community providing treatment for its wastes, it becomes less difficult to convince others of the necessity or desirability of doing likewise. It is hoped, therefore, that within a relatively few years the streams and bodies of water which have been grossly polluted will be greatly improved, and that those still in a satisfactory condition may remain so.

The elimination from the lakes and streams of Illinois of all preventable pollution is a problem of sanitation at the sources of the trouble, viz: Domestic sewage and industrial wastes, requiring for its solution

the services of experts in a highly specialized branch of engineering. The Division of Waterways has such a specialist on its engineering staff, in the person of Mr. M. C. Sjoblom, and his report on page 90 covers in more detail the problems encountered by the Division of Waterways in the control and elimination of the pollution of State waters.

#### EMERGENCY FLOOD RELIEF WORK.

It is unnecessary to describe in detail the causes leading up to the enactment of the Flood Relief Act of 1927. Such causes had their origin in the disastrous floods of 1926 and 1927, which are fully described in the Tenth Annual Report of the Division of Waterways. Suffice it to say, that an emergency existed which demanded and received prompt legislative action.

The Emergency Flood Relief Act, known as Senate Bill No. 576, is entitled, "An Act making an appropriation to furnish emergency relief in the areas in Illinois which have been inundated or damaged by floods and for the temporary repair and reinforcement of levees in such districts."

This Act, which was approved July 7, 1927, appropriated the sum of one million five hundred thousand (\$1,500,000.00) dollars to the Department of Purchases and Construction for the biennium commencing July 1, 1927, for the purpose of furnishing necessary and proper relief as specified therein.

A complete copy of the Flood Relief Act is included in the Tenth Annual Report of the Division of Waterways; also there will be found therein a copy of the Attorney General's opinion as to the powers, duties and authority of the Director of the Department under this Act.

Summarizing the opinion rendered by the Attorney General, the work which the Department is able to do must be limited to the furnishing of emergency relief by making temporary repairs or furnishing temporary reinforcements for levees which have been or which are in danger of being damaged by flood waters, and the State cannot undertake the restoration of drains or reconditioning of soil nor the building of new levees except as necessary in the repair of those which have been damaged.

The opinion of the Attorney General also was that contracts could be let without the formality of advertising and asking for bids; that the work could be done by the employment of hired labor, the purchase of materials and supplies and the purchase or rental of necessary equipment, or for an agreed price, or on a cost plus basis. The latter opinion greatly expedited the work under the Act and made it of much greater value as an emergency relief measure, it being found possible in many cases to let contracts immediately where contractors and equipment were available without the loss of time required by asking for bids.

#### INVESTIGATION.

Before a force could be organized to carry on the work a general survey was necessary to ascertain the approximate quantity of work to be done and its probable cost. To this end a blank form for a "damage claim" was prepared and sent to all drainage districts, both public and



private, as well as all known individual owners of leveed land in flood areas. This form asked for information as to length of levee breaks, estimated yardage required and approximate cost of making repairs. Information was also requested as to the average crop yield and the financial condition of the District or owner. From these forms estimated damages were tabulated and classified as primary and secondary. The primary damage, which was considered to be of first importance in the program of levee reconstruction, consisted of work necessary to protect the land from overflow by ordinary floods. The secondary damage consisted principally of wave wash and repairs which were not of such immediate importance.

#### INSPECTION.

The writer, who had been placed as engineer in charge of the work, then proceeded to make an inspection of the flooded areas and to investigate as far as possible in the short time available the needs of each community or district.

Beginning July 1st and continuing until July 10th, the areas in the southern part of the State flooded by the Mississippi River were inspected. This trip included visits to Chester, Cora City, Gorham, Murphysboro, Carbondale, Anna, Cairo and Mounds City. At these points engineers and commissioners of the various drainage districts and other interested persons were interviewed and trips of inspection arranged for and made.

#### CAIRO AND MOUNDS CITY.

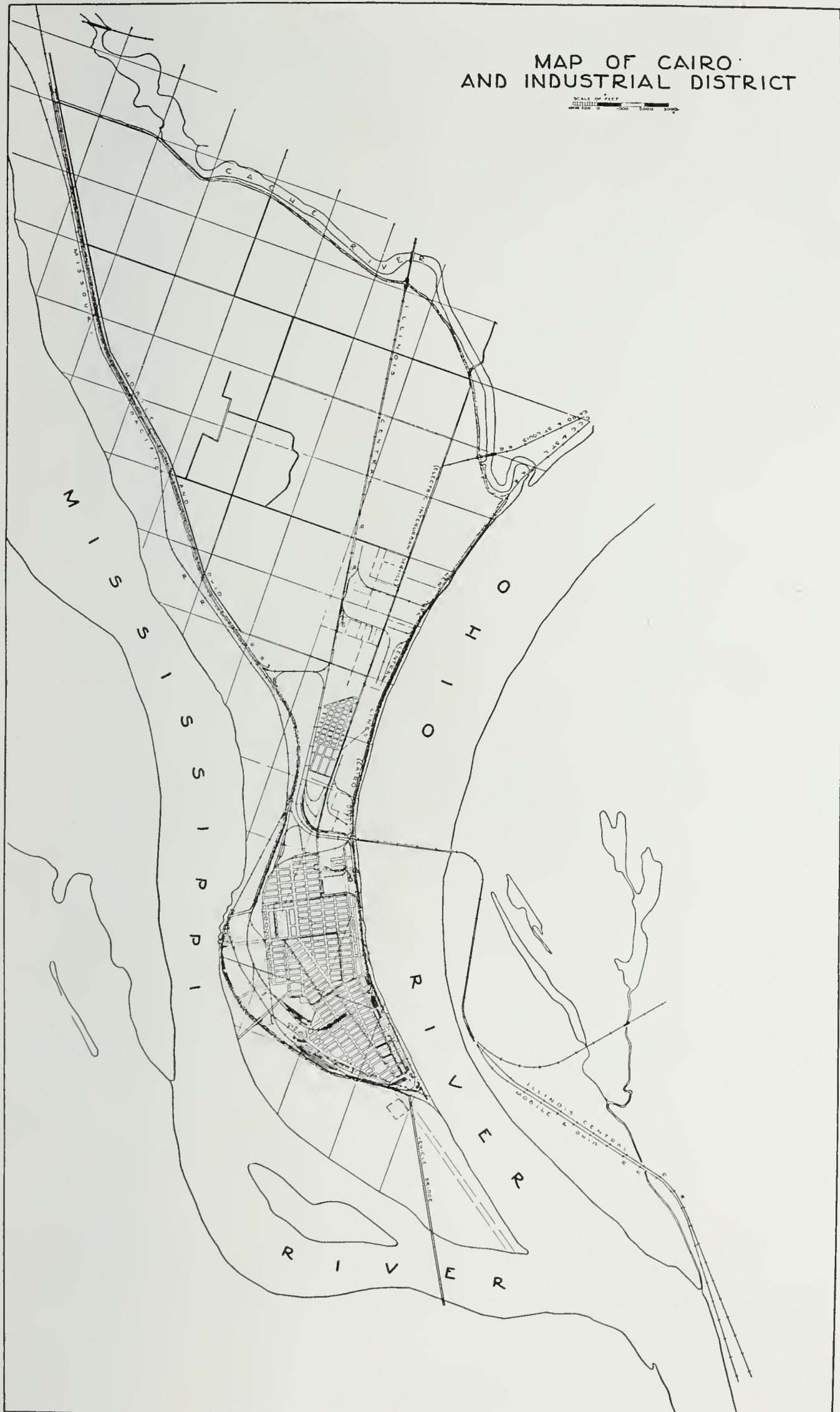
At Cairo and Mounds City, on account of the large city population subject to danger from the flood menace, a special effort was made to make a thorough inspection and to observe what aid the State could give to help remedy the dangerous situation then existing.

Due to the very efficient organization maintained by the local authorities at Cairo during the flood period, there had been no breaks in the levees, but there had been serious sand boils, bad wave wash and a sloughing off of the levees in many places. It was found also that there had been a great deal of damage and inconvenience caused by seepage and lack of sufficient interior drainage and that during flood periods the health of the inhabitants had been endangered by these conditions.

Large industries, upon which the prosperity of the city of Cairo depends, are located in the drainage districts immediately outside the city limits. Some of these industries were already considering the removal of their plants because of the flood menace. The interests of the city of Cairo and those of the drainage districts, therefore, were considered as one, consideration being given to the greatest needs of the area as a whole.

#### THE CACHE RIVER LEVEE.

The Cache River Levee of the Cairo Drainage and Levee District, protects one of the industrial districts of the city of Cairo and forms an added protection to the city itself. During the flood period there had been a continuous fight, demanding all available man power and





the expenditure of \$300,000, to keep this levee from breaking. The water had been as much as two feet above the top of this levee in places and had been kept out of the district only by the use of sand bags and the building of a timber bulkhead on top of the levee. The restoration of this levee was, therefore, considered of vital importance to the city of Cairo and vicinity.

The repair and strengthening of the Cache levee offers a striking example of the economy which, in general, characterized the flood relief work. The work, consisted of 474,431 cubic yards of earth, hauled on an industrial railroad an average distance of one and one-half miles and was placed on the levee and in banquettes for a contract price of 50 cents per cubic yard. This was at a cost of 4 cents per cubic yard less than the pre-war contract price for raising the same levee in 1914. The contractors made a small profit, in spite of numerous delays due to recurring flooding of the borrow pits.

#### HEARINGS BEFORE THE MISSISSIPPI RIVER COMMISSION.

On July 11th, Mr. William F. Mulvihill, Supervisor Illinois Waterway Construction, met the writer at St. Louis for the purpose of attending hearings before the Mississippi River Commission. Mr. Mulvihill orally presented the case of the State of Illinois and asked that due consideration be given to the needs of the flooded areas of the State in the allotment of any available funds. The reply to this plea was that such financial assistance as is called for by law would be given, but that all available funds were already pledged.

#### CITY OF EAST PEORIA.

After the flood of 1927, the city of East Peoria, Illinois, found itself in a sad plight. Farm Creek levee had broken and the city had been severely damaged. An inspection by the writer disclosed the following situation:

The City Hall and Fire Station were completely destroyed and three school buildings were damaged to a considerable extent. All equipment of their vocational school was destroyed as well as all janitor's tools and school supplies stored in the basements of these schools. There was also considerable damage to sidewalks and streets and to plumbing and sanitary systems and to building foundations. The Caterpillar Tractor Company, which has a large plant providing work for a large number of the inhabitants, sustained severe losses. This company, together with other manufacturers in the vicinity, had been contemplating enlargements to their plants but the flood menace caused them to hesitate and postpone these improvements.

#### PUBLIC HEARINGS.

During the latter part of July, as an aid to the investigation of damage claims in the Illinois River Valley, public hearings were held at Peoria, Havana and Beardstown. Representatives of flooded areas were invited to attend and present their reports of damage. Many districts, which had not theretofore sent in their damage claims, were represented at these hearings and their reports were received and the damages classified.





View of East Peoria, Illinois, which was seriously damaged by the flood of 1927.



## ORGANIZATION.

The flood relief work was separated, according to location, into two engineering divisions, one known as the South or Mississippi River Division, with headquarters at Anna, Illinois, to care for the Mississippi River and its tributaries in the State of Illinois from Cairo to Edwardsville, and the other known as the North or Illinois River Division with headquarters at Beardstown, Illinois, to care for the Illinois River and its tributaries.

A division engineer was placed in charge of each division and an engineering force organized to work under his direction.



East Peoria City Hall damaged by flood of 1927. Note Fire Department Auto in basement.

## METHODS, LETTING OF CONTRACTS.

A standard form for proposal, contract and specifications was prepared and used in nearly all cases.

Following the opinion of the Attorney General, contracts were let in many cases without the formality of advertising for bids, on the unit price, lump sum or "force account" basis as seemed most economical and expedient for the State. As noted elsewhere in this report, on account of the emergency nature of the work, it was a decided advantage to the State to be able to do this. If it had been necessary to advertise and receive bids on the large number of small contracts much time would



have been lost and relief would not have been provided in the districts and land areas when needed.

In the case of large contracts, and in other cases, when possible, competitive bids were received and the contract let to the lowest responsible bidder.

In many cases it was not possible to get contractors to bid on the work because of its locality and the small yardage involved. In such cases contracts were let to a local land owner or farmer who could finance the work. Whenever it was possible and to the State's advantage to do so, contracts were let to local men so that the farmers who had suffered losses might receive needed employment for themselves and their teams.

#### PROGRESS OF RELIEF WORK.

The Flood Relief Act is primarily an emergency relief measure. To be effective its provisions must be carried out while the emergency exists.



Nickel Plate Railway Bridge over Farm Creek at East Peoria showing drift caught by piers, which practically closed channel—Water overflowed top of Girders and destroyed levees.

Farmers who had lost their crops in the floods of 1926 and 1927 must have their levees repaired so that they could safely return to their abandoned farms, move into their homes and sow a crop of winter wheat in the fall of 1927. The people of the small towns and the cities must be reassured so that confidence would be restored and business and industry which had been partially ruined would take on new life.

At first there was a feeling among the people who had suffered flood damage that the State would not be able to repair the levees in time for the planting of wheat in the fall of 1927 or even for the planting of crops in the spring of 1928. The general opinion prevailed that any



aid to be rendered would require so much time that there would be much additional loss in crops and earnings.

This feeling of skepticism, however, was gradually dispelled by the excellent progress made by our two engineering divisions in the awarding of contracts for levee repairs.

The Flood Relief Act became effective July 1, 1927. Notwithstanding the large amount of necessary preliminary investigation required, the first contract was awarded July 18th and by August 31st twenty-two contracts had been executed for an estimated total of over \$111,000.00. By September 30th, forty-six contracts were in force totaling \$525,727.00. By the end of December, 1927, there had been awarded seventy-eight contracts for a total of \$709,978.00. At the end of the fiscal year, June 30, 1928, 100 contracts have been awarded, totaling \$912,313.23.

#### STATEMENT OF EXPENDITURES.

The following is a statement showing all money expended under the Flood Relief Act, up to the end of the fiscal year, June 30, 1928:

Emergency flood relief.....	\$768,651.85
Salaries and wages, travel, office expense, etc.....	53,693.42
Total.....	<u>\$822,345.27</u>

#### RESULTS ACCOMPLISHED.

It may truthfully be said that money being expended by the State of Illinois under the provisions of the flood relief law is of vast benefit to the people of the State and especially to the inhabitants of the flooded areas and neighboring territory and will result in improving the general welfare. Prompt action by the State in carrying out the provisions of the law has restored confidence. Aid arrived when sorely needed. Farmers who had become disheartened by the loss of two years' crops, and whose lands were largely overburdened with debt, were encouraged to continue and were enabled in many cases to establish credit where otherwise credit could not have been obtained.

#### DIVISION ENGINEERS COMMENDED.

The writer cannot too highly commend the efficiency and loyal cooperation, in the performance of a public duty of the Division of Waterways exhibited by the Division Engineers on the flood relief work.

Mr. William T. Blunt came into our service after a long and honored career as Assistant Engineer in the United States Engineer Department, and his untimely death on March 3, 1928, may have been due to the effect of unusually inclement weather on a day of voluntary duty when his weakened physical condition was concealed by him from his associates.

Mr. L. C. Craig was induced to resign his position as Designing Engineer in the Navy Department at Port au Prince, Haiti, in order that the State might receive the benefit of his previous years of experience in levee and drainage district work along the Illinois River.

Mr. George F. Patrick, fresh from his work as Resident Engineer on the construction of Wacker Drive, Chicago, was placed in local charge of the repair work of the Banner District levees by Mr. Mulvihill before



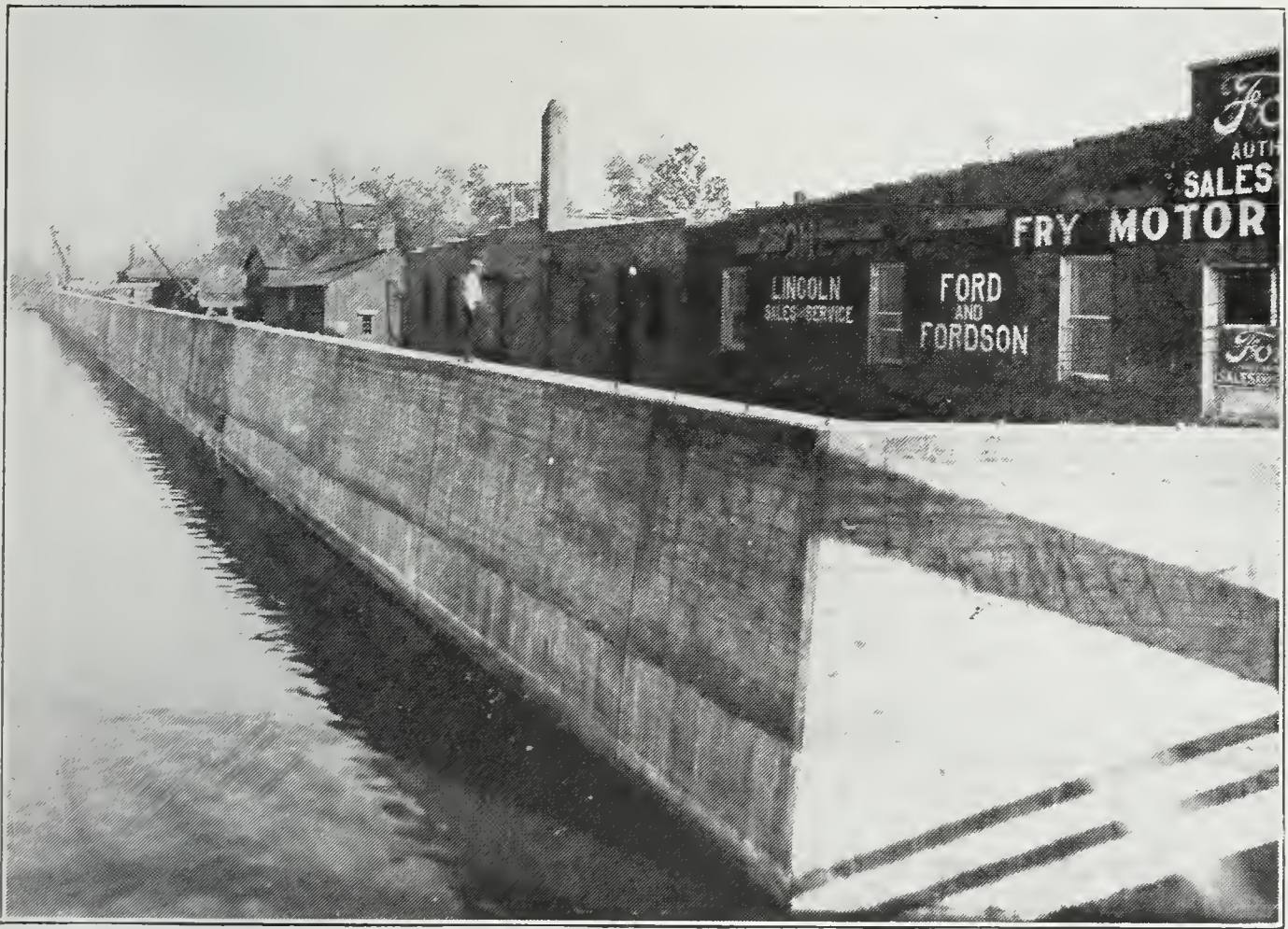
the ink was dry in the Governor's signature to the Act, and he eventually became the Division Engineer of the Southern Division.

Mr. John H. Walker, for many years Assistant to the Chief Engineer of the Fuller Company, was engaged as personal assistant to the writer, and in addition to other duties, handled in a most efficient manner all of the writer's Chicago office routine work in connection with flood relief.

Progress reports of the Division Engineers covering the work of each division appear on pages 94 and 97.

#### BEARDSTOWN FLOOD RELIEF.

Concrete sea wall and earth levees, designed to protect the city of Beardstown from a repetition of the damages wrought by the floods of 1922, 1926 and 1927, were constructed during the fiscal year.



This concrete wall constructed by the Division of Waterways protects the City of Beardstown from the ravages of the Illinois River. Total cost of protective works including contributions by the railroads and City of Beardstown was over \$400,000.

This office prepared several plans with estimates of cost for this work, all of which were described on pages 18 to 29 of our Seventh Annual Report. None of the proposed plans could be carried out for the amount of the appropriation (\$350,000) made by the Fifty-third General Assembly. Local interests could not provide the additional funds required and public fear of a repetition of such a flood rapidly subsided. The fall flood of 1926 and spring flood of 1927 again submerged the city for several weeks and definitely aroused the city to the urgent necessity of adequate flood protection.

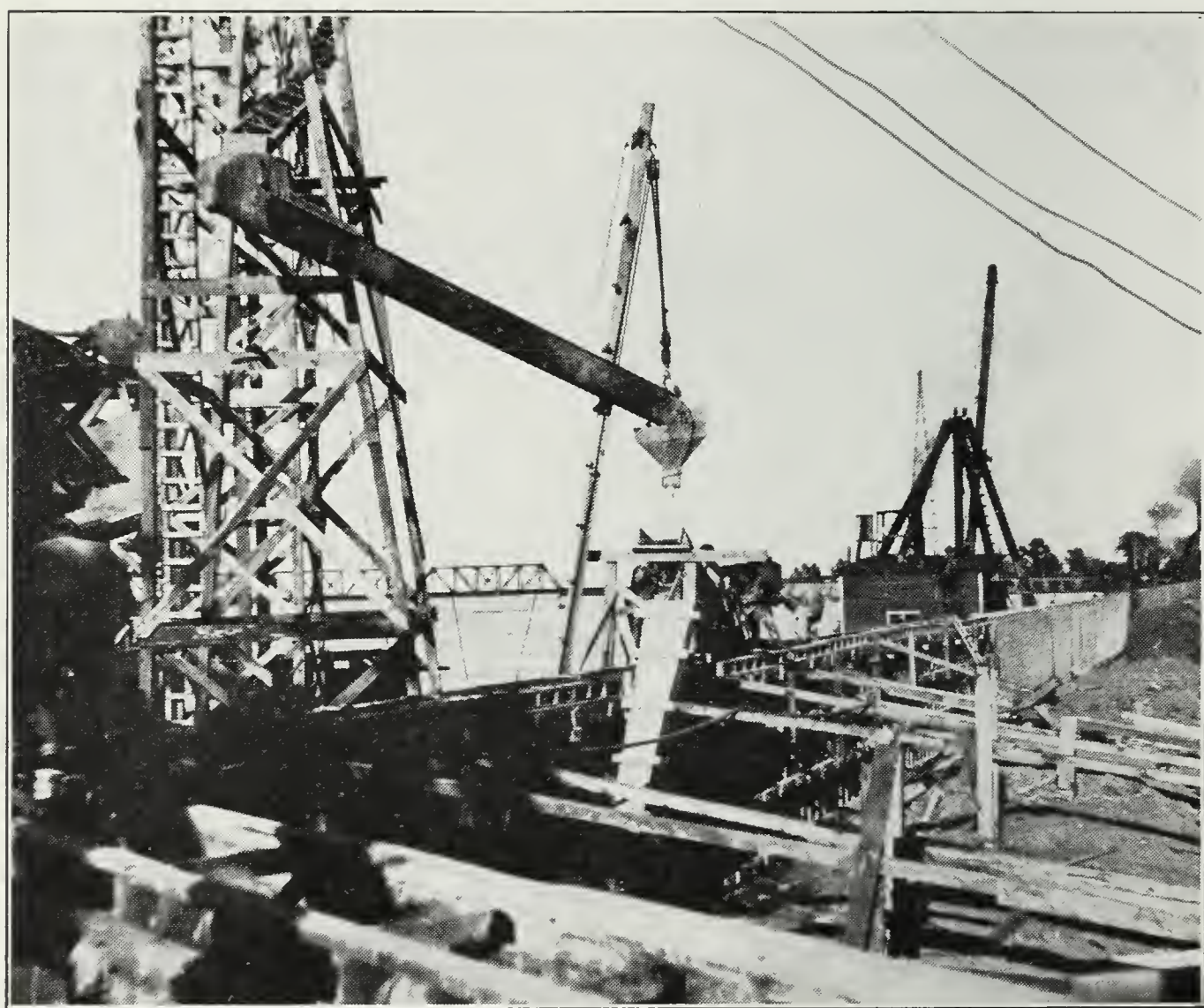


Mr. Mulvihill and the writer had several conferences with the officials and leading citizens of the city, and eventually additional funds were raised by contributions of \$41,000 from the Chicago, Burlington & Quincy and \$5,000 from the Baltimore & Ohio Railroads, both of which would be benefited by the proposed improvement, and conditional upon changes in the plans and a time limit for construction.

Proposals for the work were received on May 25, as shown by the canvass of bids on page 61, but the award of contracts had to wait the reappropriation of funds by the Legislature.

#### TWO PRINCIPAL CONTRACTS AWARDED.

The Fifty-fifth General Assembly on June 30th passed an Act re-appropriating \$350,000, which Act was immediately approved by the



Building the Beardstown Sea Wall to protect the City from overflow by the Illinois River. This wall is over 3,000 feet long and will protect against a flood stage of 27.75 feet. Projecting from the top of the walls are iron pipes into which flashboards 2 feet high may be quickly fitted providing additional protection. Earth levees connect with the wall at either end extend to the high land back of the city.

Governor, and on the following day, July 1, 1927, the Director signed contracts with the low bidders, J. O. Heyworth, Inc., for the concrete walls, and the McWilliams Dredging Company for the levee work.

The Heyworth Company commenced work on July 25 and continued without interruption, except during a two weeks' flood period, until the completion of the work on December 31. The completion of this work within contract time was an excellent example of sound con-

struction practice which paid dividends. They used steel sheet piling for cofferdams several feet higher than the records indicated as necessary and successfully withstood three high-water periods, during which other work on the river had to be discontinued.

The McWilliams Dredging Company pushed their work vigorously at all times, but owing to adverse weather and frequent but moderate high-water periods, they were seriously delayed, but substantially completed the work by the end of the fiscal year. The levees, as constructed required 498,520 cubic yards of material.

The contract location plans for this work were those of Project 3 on page 27 of the Seventh Annual Report and show six city blocks along the river left outside the sea wall. As finally completed the concrete wall encloses these six blocks and the entire city is now safe from floods three feet higher than the record flood of 1926. This was accomplished by changes in the design, type and location of structures, made during the progress of the construction work.

The contract with Jas. O. Heyworth, Inc., for concrete sea wall work was completed with quantities and costs as follows:

#### CONCRETE SEA WALL.

Item.	Quantity.	Cost.
Cofferdam.....	2,208 lin. ft. ....	\$27,600.00
Excavation.....	10,300 cu. yds. ....	10,300.00
Concrete.....	10,952 cu. yds. ....	98,473.00
Metal work.....	54.9 tons .....	11,172.45
Vertical piles.....	31,556 lin. ft. ....	23,667.00
Battered piles.....	8,349 lin. ft. ....	9,116.45
Backfill.....	18,220 cu. yds. ....	10,932.00
		<hr/>
Cement sacks charged to contractor.....		\$191,260.90
		5,277.60
		<hr/>
Total payment on contract.....		\$185,983.30

#### EXPENDITURES—BEARDSTOWN FLOOD PROTECTION.

The total expenditures in connection with the Beardstown Flood Protection Work were as follows:

#### ENGINEERING AND CONTINGENCIES.

Salaries and wages .....	\$6,880.30	
Office expense .....	447.79	
Travel expense .....	1,273.59	
Repairs .....	21.63	
Equipment .....	31.05	
Advertising and printing.....	286.30	
	<hr/>	\$ 8,940.66

#### PERMANENT IMPROVEMENT.

Jas. O. Heyworth wall contract—Total payment.....	185,983.30
Concrete wall, paid for by city of Beardstown.....	4,300.00
McWilliams Dredging Company levee contract—Total payment.....	138,281.99
Dessel & Sons, contract for culvert installation at Meredosia road.....	1,349.54
C. B. & Q. R. R., sewer installation.....	1,053.66
Cement purchased by State.....	30,700.08
3 Armco culverts and gates (including gate for Meredosia road).....	4,148.19

#### LAND.

Right-of-way purchases.....	\$22,976.25	
Goodell & Millard.....	925.91	
C. of C. R. of W. committee.....	850.00	
Legal expenses paid by Beardstown Sanitary District....	176.11	
Right-of-way purchased by city of Beardstown.....	400.00	
	<hr/>	25,328.27
Total .....		<hr/>
		\$400,085.69



The source of funds was as follows:

State appropriation .....	\$350,000.00	
Contributed by C. B. & Q. R. R.....	41,000.00	
Contributed by B. & O. R. R.....	5,000.00	
Contributed by Beardstown City and Sanitary District	4,876.11	
		<hr/>
		\$400,876.11
Balance .....		\$790.42
Returned to general fund.....		661.25
		<hr/>
Free available balance .....		\$129.17

No sewers or sewage pumping plants were provided for in the State's plans, nor did these plans provide for maintenance of the levees. A Sanitary District, embracing the entire area, has been created by vote of the inhabitants in order to raise funds to build sewers and to build and operate a pumping plant and maintain the levees.

## PRINCIPAL WORK OF THE DESIGNING SECTION.

Report of WALTER M. SMITH, *Designing Engineer*.

The Designing Department at the beginning of the year consisted of:

- 1 Chief Designing Engineer.
- 3 Assistant Engineers.
- 2 Assistant Engineers on half time basis.
- 2 Draftsmen.

The work of this force during the preceding fiscal year was 2,630 man days, of which 1,155 man days was on work not connected with Illinois Waterway construction.

The following changes took place during the year:

- 2 Assistant Engineers were added on July 11th.
- 1 Draftsman was added on July 19th.
- 1 Draftsman was added in December.
- 1 Assistant Engineer was added December 12.
- 1 Draftsman was added January 13, 1928.
- 1 Draftsman was added January 16, 1928.
- 1 Assistant Engineer was added January 16, 1928.
- 1 Electrical Engineer was added February 1, 1928.
- 1 Mechanical Engineer was added February 13, 1928.
- 1 Draftsman was added March 26, 1928.
- 1 Assistant Engineer resigned on November 30, 1927.
- 1 Draftsman resigned on March 29, 1928.
- 3 Assistant Engineers were promoted to Designing Engineers May 1, 1928.

At the end of the year the Designing Department consisted of:

- 1 Chief Designing Engineer.
- 3 Designing Engineers.
- 1 Electrical Engineer.
- 1 Mechanical Engineer.
- 3 Assistant Engineers.
- 2 Assistant Engineers on half time basis.
- 6 Draftsmen.

The work of this force during the fiscal year totaled 4,493 man days, of which only 474 man days was on work other than for Illinois Waterway design and inspection.

## LOCK GATES AND ANCHORAGES CONTRACT 4D.

When the gates at Lockport were allowed to swing on the pintles and hinges it was found that they twisted badly, the miter posts being well out of a vertical line. An additional vertical line of plates was then placed near each end on the upstream side and diagonal tension bars with turn-buckles were placed on the upstream side to adjust the gates to a vertical position and hold them there. This remedied the trouble at once.

## DRESDEN ISLAND LOCK AND DAM CONTRACT NO. 3.

This contract was formerly prepared to include only the metal work necessary to embed the masonry. It was decided to revise the drawings and specifications so as to include all metal work except operating machinery. The drawings were revised and specifications were rewritten to conform to this.

Later it was decided to separate the metal work from the masonry at this site, to combine this metal work with that required for the Brandon Road job—except reinforcing steel and certain valves and steel and iron castings for the Brandon Road job which had been purchased outside—and advertise for this as Contract No. 10.

It was also decided to combine the Brandon Road and Marseilles bridges into one contract as Contract No. 11 and to advertise this contract under the same specifications and cover as Contract No. 10.

Specifications and drawings for these contracts were completed ready for printing.

## MARSEILLES CANAL AND RIVER EXCAVATION CONTRACT NO. 9.

It was decided to combine the Marseilles Canal excavation and excavation in the various pools in the river and advertise as Contract 9 but to provide that the excavation for Marseilles Canal might be let as a separate contract to that for the pool excavation. Specifications and drawings were prepared and the contract advertised on June 13, 1928.

## STARVED ROCK LOCK AND DAM CONTRACT NO. 2.

Designs of cofferdams for the various stages of this contract were submitted and checked. Some changes were recommended and after being made, except in the case of the lower approach cofferdam for the lock the designs were recommended for approval. In case of the cofferdam for the lower approach of the lock in which changes were desired, no revised design was sent in and the cofferdam design in that case was not recommended for approval.

## STARVED ROCK METAL WORK CONTRACT NO. 7.

A contract for the metal work required at Starved Rock in addition to that embedded in the masonry was let to the Independent Bridge Company of Pittsburgh, Pa., in November, 1927. Many shop drawings were submitted, checked and approved.



ILLINOIS WATERWAY.

CONTRACT NO 7—CANVASS OF BIDS RECEIVED NOVEMBER 2, 1927.

Item number.	Item.	Unit.	Quantities.	Independent Bridge Co., P. O. box 1920, Pittsburgh, Pa.		Duffin Iron Works, 37 W. Van Buren St., Chicago, Ill.		Ashton and Russell, 168 W. Washington St., Chicago, Ill.		Average of all bids received.	
				Price.	Amount.	Price.	Amount.	Price.	Amount.	Price.	Amount.
A	Cofferdams, pumping, drain-	Lump sum	1	\$5,000 00	\$ 5,000 00	\$65,000 00	\$65,000 00	\$24,000 00	\$24,000 00	\$31,333 33	\$ 31,333 33
B*	ing and removing	1,000 ft. B. M.	1	150 00	150 00	130 00	130 00	163 00	163 00	147 67	147 67
C	Pine and fir timber	1,000 ft. B. M.	17	-175 00	2,975 00	230 00	3,910 00	177 50	3,017 50	194 17	3,300 83
D	White oak timber	Pound	12,203	15	1,830 00	40	4,880 00	293	3,574 60	281	3,428 20
E	Wrought iron pipe and fittings	Each	4	3,000 00	12,000 00	2,600 00	10,400 00	2,725 00	10,900 00	2,775 00	11,100 00
F	Lock valves complete	Pound	3,180,000	9 06	305,280 00	1 05	333,900 00	1287	409,266 00	109	349,482 00
G	Structural steel	Pound	123,000	20	24,600 00	18	22,140 00	2743	33,738 90	218	26,826 30
H	Steel castings	Pound	60,000	30	18,000 00	30	18,000 00	34	20,400 00	313	18,800 00
I	Steel forgings	Pound	3,000	30	900 00	26	780 00	36	1,080 00	307	1,920 00
J	Special steel forgings	Pound	15,000	90	13,500 00	1 10	16,500 00	1 217	18,255 00	1 072	16,085 00
K	Forged monel metal	Pound	77,000	05	3,850 00	07	5,390 00	09	6,930 00	07	5,390 00
L	Metal reinforcements	Pound	2,100	15	315 00	25	525 00	505	1,060 50	301	633 50
M	Spring steel	Pound	7,700	15	1,155 00	20	1,540 00	175	1,347 50	175	1,347 50
N	Cold rolled steel shafting	Pound	7,700	30	2,310 00	25	1,925 00	2723	2,096 71	274	2,110 57
O	Gray iron castings	Pound	30,400	10	3,040 00	15	4,560 00	162	4,924 80	137	4,174 93
P	Lead alloy	Pound	2,630	60	1,578 00	75	1,972 50	893	2,348 59	747	1,956 37
Q	Bronze	Pound	250	60	150 00	1 00	250 00	915	2,228 75	838	2,095 58
R	Rabbitt	Each	2	400 00	800 00	450 00	900 00	490 78	981 56	446 92	893 85
S	24" gate valves	Each	5	14 00	70 00	18 00	90 00	14 05	70 25	15 35	76 75
T	3" gate valves	Each	4	12 00	48 00	18 00	72 00	1 30	45 20	13 77	55 06
U	2" gate valves	Each	4	10 00	40 00	12 00	48 00	8 47	33 88	10 16	40 63
V	1 1/2" gate valves	Each	4	8 00	32 00	8 00	32 00	6 99	27 96	7 67	30 65
W	1 1/4" gate valves	Each	14	7 00	98 00	8 00	112 00	6 39	89 46	7 13	99 82
X	12" sluice gates	Each	10	150 00	1,500 00	160 00	1,600 00	152 90	1,529 00	154 30	1,543 00
Y	2" radiator valves	Each	6	41 00	246 00	7 00	42 00	27 12	162 72	25 04	150 24
Z	Concrete	Cu. yd.	540	20 00	10,800 00	50 00	27,000 00	29 25	15,795 00	33 08	17,865 00
AA	Sand	Cu. yd.	27	5 00	135 00	5 00	135 00	5 50	148 50	5 17	139 50
BB	Crescoted lumber	1,000 ft. B. M.	37	150 00	5,550 00	140 00	5,180 00	297 00	10,989 00	195 67	7,239 67
CC*	Crescoted wood blocks	Sq. yd.	100	4 00	400 00	4 00	400 00	7 83	783 00	5 276	527 67
DD	Electric cable	Pound	36,300	30	10,890 00	42	15,246 00	60	21,780 00	44	15,972 00
EE	Electric cable hangers	Each	34	2 00	68 00	3 00	102 00	5 60	190 40	3 53	120 13
FF	Electric cable racks	Each	322	2 00	644 00	2 75	885 50	4 40	1,416 80	3 05	982 10
GG	Electric cable hooks	Each	1,260	60	756 00	60	756 00	1 37	1,726 20	856	1,079 40
HH	Electric cable supports	Each	150	4 00	600 00	5 00	750 00	8 15	1,232 50	5 72	860 83
II	2" fiber conduit	Lineal ft.	900	30	270 00	60	540 00	57	513 00	49	441 00
	Total				\$429,580 00		\$545,693 00		\$600,846 28		\$525,373 09

\* Items "B" and "CC" entered for price only.

## GATE AND VALVE OPERATING MACHINERY CONTRACT NO. 8.

Drawings and specifications for this contract were prepared and printed, ready for advertising the contract.

## ELECTRIC LIGHTING, POWER AND SIGNALING INSTALLATION.

Considerable work was done on the design of the lighting and signaling system for the various locks. In connection with this work the electrical engineer made a very thorough inspection of the corresponding work on the New York Barge Canal and interviewed various operatives as to its success.

## COLUMBUS STREET BRIDGE, OTTAWA.

Drawings of operating and end lifting machinery were submitted by the contractors, checked, approved and the machinery installed. Tests were made and the bridge thrown open to traffic.

## ROMEO BRIDGE.

Some work was done on the design and drawings for this bridge from time to time but it was not completed.

## AUX SABLE AQUEDUCT.

A steel aqueduct was designed to carry the Illinois and Michigan Canal across Aux Sable River similar to the Fox River Aqueduct at Ottawa. Drawings and specifications were prepared, the contract let in November, shop drawings submitted, checked and approved, and the aqueduct built.

## FOX LAKE DAM.

Work was begun on design and drawings for a dam at Fox Lake, an appropriation for which was made by the last Legislature. Owing to uncertainty in the bill as to the location of the dam and to a diversity of opinion regarding the same, it was decided to postpone action pending the determination of the questions in dispute.

## MC HENRY DAM—FOX RIVER.

A concrete floor was placed on top of the old crib dam at McHenry about two miles below Fox Lake on the Fox River.

## MEYERS' BAY BRIDGE, FOX LAKE.

A reinforced concrete bridge at Meyers' Bay, Fox Lake, was designed, drawings made and contract let for construction.

## GUM CREEK CULVERT.

A reinforced concrete culvert was designed, drawings furnished, and the structure built by Woods Bros. Construction Co., at the place where Gum Creek passes under the Illinois and Michigan Canal near Marsailles.



## MISCELLANEOUS.

## PAINT.

Tests of various kinds of paint for painting steel under water which have been carried on for several years by submerging steel plates coated with the various samples of paint in the waters of the Illinois and Michigan Canal at Joliet were continued. The test plates were examined from time to time. Up to the present time nothing has been found equal to pure red lead. This paint calling for red lead of 97 per cent purity has been specified on all our structural steel work.

It was found impossible to get paint with the red lead of this purity without having an analysis made of every order of paint used. This has caused quite an increase in the cost of painting.

## DRAWINGS.

The following drawings have been made during the year. These are all standard size drawings.

Original Drawings on paper.....	63
Finished tracings .....	205
Tracing paper .....	19
Cross section paper.....	3

Total .....	290
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In addition 180 important blue-prints have been given accession numbers and filed for future use. Also 105 shop-prints have been carefully checked, approved and returned to contractors.

## REPORT OF R. S. HEATH, RESIDENT ENGINEER.

A report of operations for the Joliet Division on the Illinois Waterway for the year ending June 30, 1928.

## CONTRACT NO. 4—LOCKPORT LOCK.

Contract No. 4, for the construction of the Lockport Lock at the end of the Chicago Sanitary District main channel, was practically completed by Green & Sons Company, considerably before the end of the previous fiscal year 1927. However, due to other work being carried out by them on adjacent property for the Sanitary District of Chicago, it was deemed inadvisable to complete such items as cleaning up the site, some painting, etc., at that time.

The only work done during this fiscal year was the removal of the wreckage of the cableway towers damaged in May, 1927; the removal of the cableway beams by the No. 70 Bucyrus shovel, the material from which was deposited along the east edge of the east lock spoil bank; partial clean up of the site; and some extra work. The extras consisted of installing gage boards, gear covers for lift gate machinery and a foot bridge over deep run. Some work was done on the reframing of the old Sanitary District swing bridge to make it suitable for installation across the creek on the new spur track. However, this construction as well as the removal of some excavation on the west bank of the canal was later waived by the Sanitary District.

The final voucher was made out in December, 1927, as shown below. Although some equipment still remained on the site it will be removed when the other work for the Sanitary District is completed.

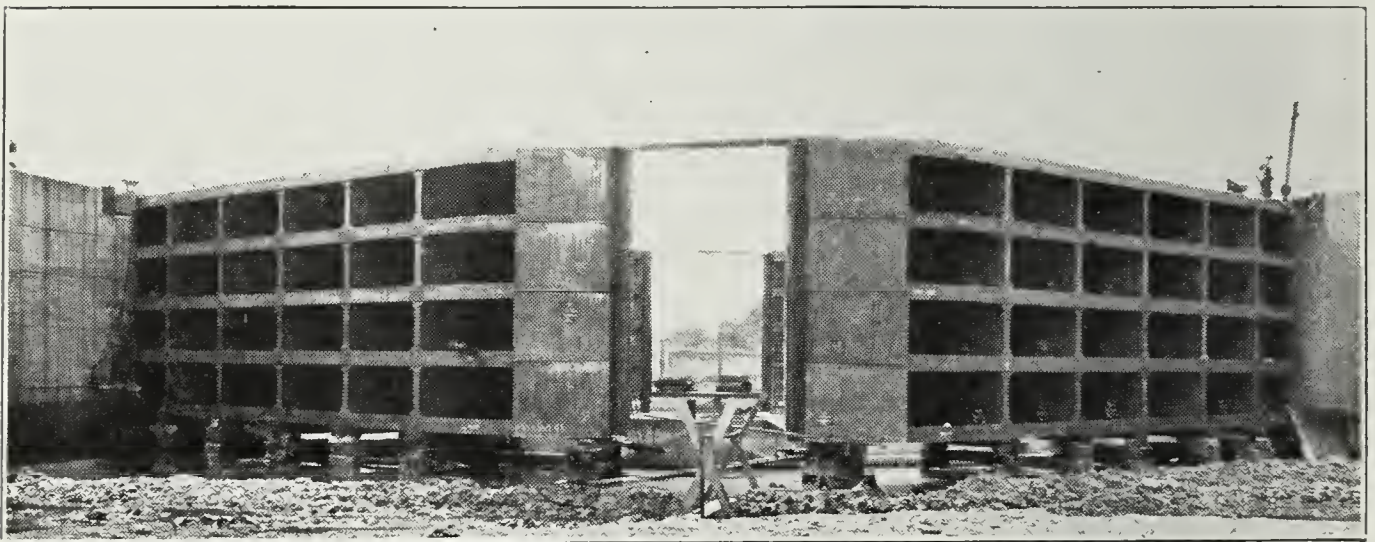
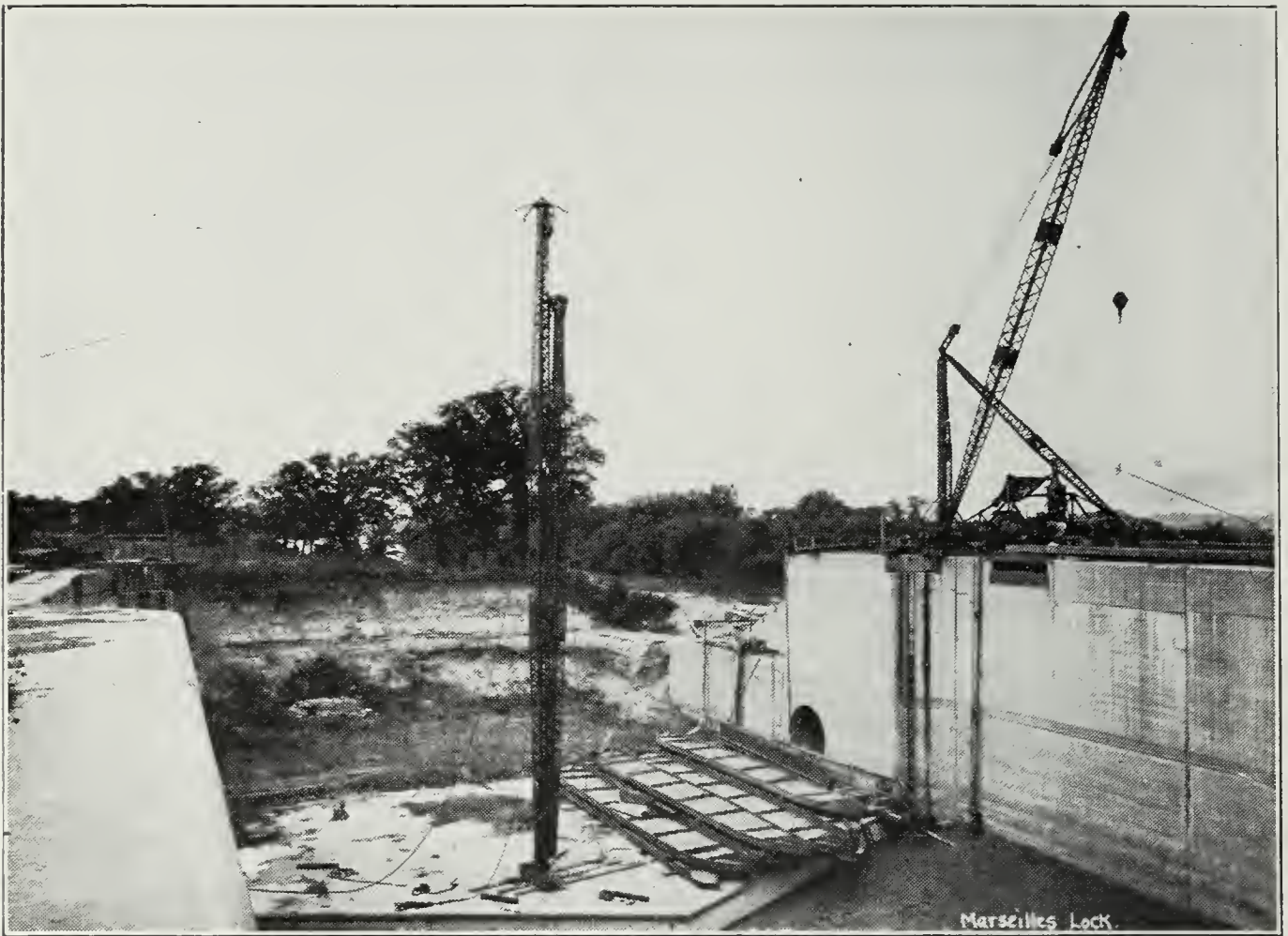
Character of Work.	Quantity Completed.		Amount Earned.
Clearing.....	100	per cent .....	\$ 8,750.00
Cofferdam.....	100	per cent .....	190,000.00
Excavation.....	148,285.1	cu. yds. ....	296,570.20
Channeling.....	46,585.9	sq. ft. ....	23,292.95
Pine and fir timber.....	25,838	M. ft. ....	2,583.80
White oak timber.....	2,417	M. ft. ....	483.40
Structural steel.....	1,485,432	lbs. ....	148,543.20
Steel castings.....	60,940	lbs. ....	10,359.80
Grey iron castings.....	29,788.1	lbs. ....	3,574.57
Steel forgings.....	43,188.3	lbs. ....	10,365.19
Concrete.....	91,217.35	cu. yds. ....	602,034.51
Metal reinforcement.....	41,623	lbs. ....	2,081.15
30" vitrified pipe.....	15	ft. ....	75.00
30" vitrified pipe specials.....	48	ft. ....	768.00
24" vitrified pipe.....	73.9	ft. ....	221.70
24" vitrified pipe specials.....	11	ft. ....	132.00
18" vitrified pipe.....	450.2	ft. ....	1,215.54
18" vitrified pipe specials.....	39	ft. ....	312.00
8" vitrified pipe specials.....	151.1	ft. ....	151.10
6" vitrified pipe specials.....	1,005.6	ft. ....	150.84
4" vitrified pipe specials.....	99.9	ft. ....	39.96
Wrought steel pipe and railings.....	15,187	lbs. ....	2,278.05
6" and 8" cast iron pipe.....	11,015	lbs. ....	771.05
Shutter gate valve sets.....	6	.....	2,340.00
6" quick operating gate valves.....	3	.....	120.00
3" fiber conduit.....	3,376.8	ft. ....	1,350.72
Lift gate machinery.....	100	per cent .....	40,000.00
50 H. P. electric motors.....	2	.....	4,000.00
Culvert valve gates.....	4	.....	8,000.00
Extras Nos. 1, 2, 3 and 4.....	100	per cent .....	2,242.39
Extras No. 5.....	100	per cent .....	1,400.00
Extras No. 6.....	100	per cent .....	228.75
Extras No. 7.....	100	per cent .....	362.27
Extras No. 8.....	100	per cent .....	1,453.82
Extras No. 9.....	100	per cent .....	8,030.07
			\$1,374,282.03
Deduction—Personal bond and cement used by contractor.....			20,374.20
Contract completed—Net total .....			\$1,353,907.83

#### CONTRACT NO. 4D—LOCK GATES.

Contract No. 4d, for the construction and erection of the lower miter gates at the Lockport Lock, and the upper and lower miter gates and culvert valves at the Marseilles Lock, was well under way at the beginning of the fiscal year. The contract for this work was let to the Independent Bridge Company of Pittsburg, Pa., who sublet the work to the Duffin Iron Co. of Chicago. The latter firm handled the fabrication of the steel work, but sublet the erection to the Powers & Addy Co. of Indianapolis, Ind. Practically all of the steel had been fabricated for both locks and the delivery and erection, except for riveting and anchorage assembly, completed at Lockport during the previous fiscal year. Progress during this year has been very slow. Delays due to excessive caulking necessary on the air chamber at Lockport, failure to provide paint capable of passing the specifications and the employment of insufficient men at Marseilles, retarded the work so that the completion of the painting was impossible before the cold wet weather set in during the winter. The loss of the cofferdam at the lower end of the Marseilles Lock, due to an ice jam causing overtopping on December 20, 1927, also delayed the work.



When the south guard gate at Marseilles was removed from its blocking on November 20th, sufficient lean up stream was noted to make it advisable to install extra end plates and turn-buckles on all the gates.



Two views of lock gate construction at Marseilles, August 12, 1927. Like the others of the series this lock is 110 feet wide, has a usable length of 600 feet with 14 feet of water over the miter sills, and has a lockage capacity of 9,000 tons.

During the summer and fall of 1927 the electrical cables were installed at both locks. This was an extra item and was sublet to the Fries-Walters Co., electrical contractors of Chicago.

Except for a few minor items of cleaning, painting, concrete, etc., at Marseilles, the contract was completed on June 30th.



## PROJECTS NOS. 5 AND 6—BRANDON ROAD POOL.

On October 27, 1927, an agreement was signed with Green & Sons Company of Chicago to superintend construction of the Brandon Road Pool (Project 6) and the Brandon Road Lock and Dam (Project 5) on a fee basis, the State furnishing all labor, material and equipment.

## PLANT.

Work on Project 5 started on November 14, 1927, when a Link Belt dragline was unloaded at the Chicago Gravel Company's Rockdale Spur. The construction of office building for Green & Sons Co. and



Construction work on Brandon Road Lock and Dam showing excavation for side walls of the lock chamber. Dragline with 100-foot boom in foreground.

State forces was started the next day. Shop and office buildings, yard tracks, gravel storage trestle, track connection across the Illinois & Michigan Canal to the Illinois Traction System and a 6-inch well drilled 800 feet deep, were completed in the spring.

## EXCAVATION.

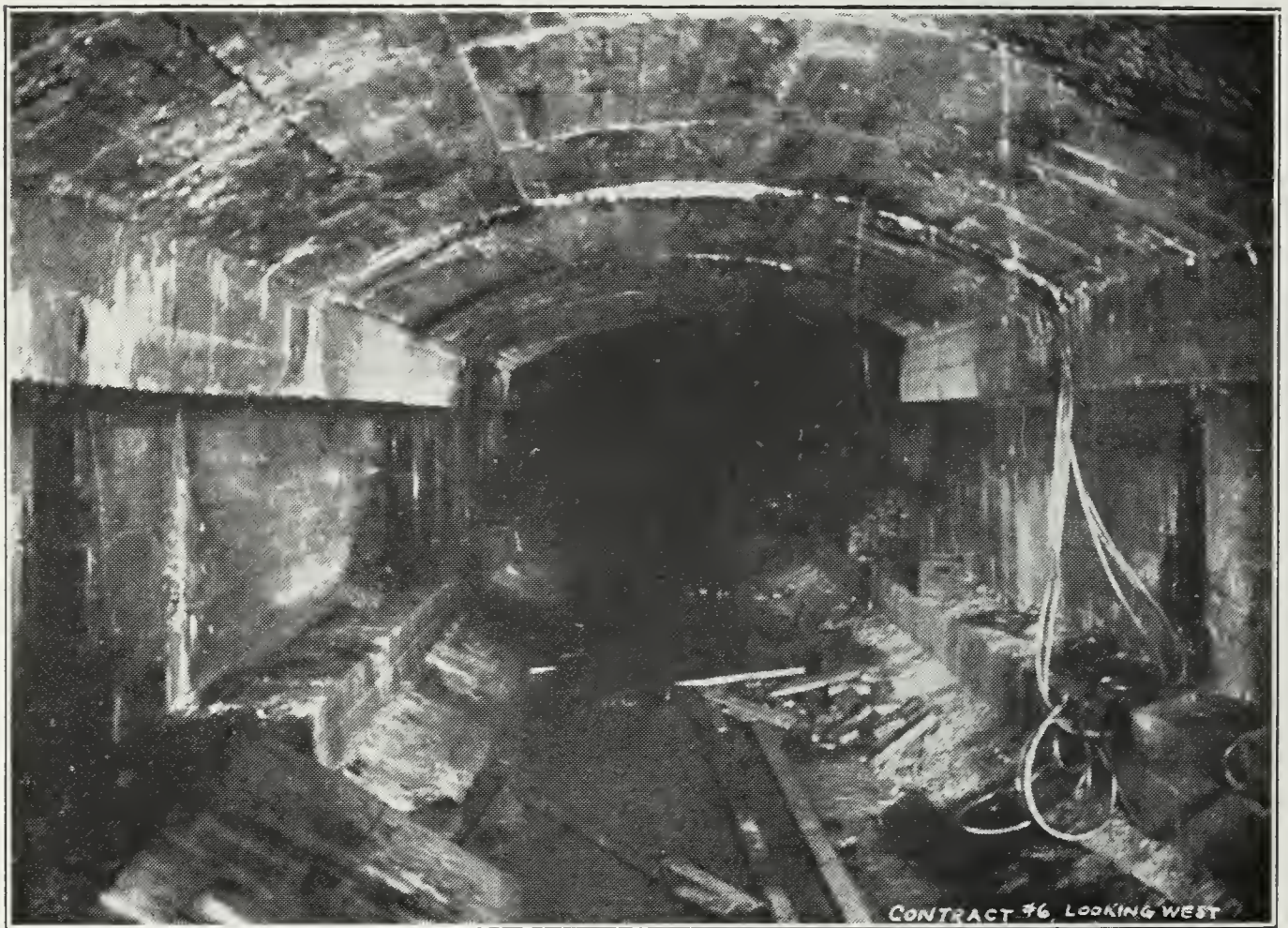
On the 18th of November, 1927, following an inspection trip to the Lockport Lock and a dinner at the Joliet Chamber of Commerce, participated in by commercial interests of Chicago, Joliet and many from all parts of the State, Governor Len Small removed the first shovelful of earth. The Link Belt dragline was used for the purpose.



General excavation was started on January 6, 1928, when the Link Belt began stripping the site of the dam west of the lock and casting the earth to the north to form a dike around the work. This was followed soon after by stripping of the black dirt from the lock site by a 100-foot boom Marion dragline. Rock excavation began April 6th in the west core wall and on May 10th in the lock prism.

#### CONCRETE.

Concreting starting on April 19th in the east core wall, in the west wall on April 30th and in the lock walls on June 4th. Yard paving mixers were used and serviced by trucks of two and three batch capacity, loaded by bucket conveyors of the caterpillar type with strike-off hoppers.



View of utilities tunnel, 75 feet below the DesPlaines River level at Joliet. Size about 10x15 feet and 350 feet long; excavated through solid rock.

Concrete was placed in the core wall by the Link Belt dragline and in the lock walls by a 115-foot boom steel guy derrick. Blaw-Knox steel traveling forms and a 66-foot belt conveyor were ordered for pouring the walls of the locking chamber..

Other items such as channeling, cofferdams, etc., progressed satisfactorily and the work in general was ahead of the usual progress on such work. The following is the work done to date:

Character of Work.	Quantity Completed.	Percentage Completed.
Excavation.....	72,101 cu. yds. ....	23.8
Channeling.....	16,501 sq. ft. ....	65.0
Structural steel.....	1,940 lbs. ....	0.06
Metal reinforcement.....	969 lbs. ....	0.3
Concrete.....	6,947 .....	4.28
Total job.....	.....	8.3



## GENERAL.

Work on Project No. 6 started on December 15th with the construction of a tool house and office building at the foot of Washington Street in Joliet. Work of laying out lines for the east wall started on December 17th with A. N. Dunaway in charge temporarily. He was relieved on January 10th, when G. P. Fleetwood reported for duty as resident engineer, under whose supervision the balance of the work was carried out.



Part of the core wall of the State Dam at Brandon Road. This wall is 35 feet high and is embedded in solid rock. It is intended to prevent sloughing of earth from saturation or injury to the dam from burrowing animals.

## TUNNEL.

The first ground was broken on January 12th when the stripping of the east shaft of the Van Vuren Street tunnel was started, using a Link Belt dragline which was received on January 10th. Rock excavation started on January 21st and proceeded slowly on account of excessive water. All excavating was completed on June 12th except for a little trimming for the two head houses during June. Concreting was started on June 13th and 58 lineal feet were completed by June 30th.

## EXCAVATION.

Excavation for the walls was started on May 14th at the intersection of the spillway on the east wall. The Link Belt dragline was



used for this purpose. Earth excavation was completed from Station 32 plus 20.33 to Station 39 plus 00 and rock excavation to Station 34 plus 92. An additional Link Belt dragline was received on June 27th to allow earth and rock excavation to proceed at the same time.

#### CONCRETE.

Although no concrete was poured on the walls, Blaw-Knox traveling forms for the wall sewers were received and one section at the lower end of the east wall was partially erected. The traveling forms for the east wall were ordered delivered so concreting could start about August 1st.

#### COFFERDAM.

In addition to the pumping of the Van Buren Street tunnel and the east wall footings, a rock and earth cofferdam was built up along the west side of the east wall from Station 32 to Station 55, using material excavated from the footing and hauling with caterpillar tractors and Athey trailers with hydraulic dump bodies.

The quantities of work done to date are as follows:

Character of Work.	Quantity Completed.	Percentage Completed.
Excavation (Tunnel).....	3,331 cu. yds. ....	99.4
Excavation (Walls).....	12,880 cu. yds. ....	6.25
Concrete (Tunnel).....	190 cu. yds. ....	13.5
Total Job.....		4.2

### REPORT OF

J. B. BASSETT, *Division Engineer.*

A report of operations in the Ottawa Division of the Illinois Waterway for the year ending June 30, 1928, is presented below:

#### CONTRACT NO. 2—STARVED ROCK.

Contract No. 2, let to Woods Brothers Construction Company of Lincoln, Neb., under date of February 5, 1926, provides for the construction of a lock and dam in the Illinois River at Starved Rock, near Utica, Ill. Construction work started by way of excavation by Wilson & Company, sub-contractors, on March 18, 1926, and by June 30, 1927, the contract was about 35 per cent completed.

#### GENERAL.

Operations at the beginning of the year consisted of the continuation of concrete construction of the lock, the excavation for which had been completed, and the excavation in the upper approach above the cofferdam embankment and by June 30, 1928, the contract was about 75 per cent completed and 12 months behind schedule on account of frequent floods in the previous fiscal year.

Weather conditions were generally good during the entire year, there having been about 40 days lost time on the work within the main cofferdam, three-quarters of which were due to seasonal conditions during the winter months.

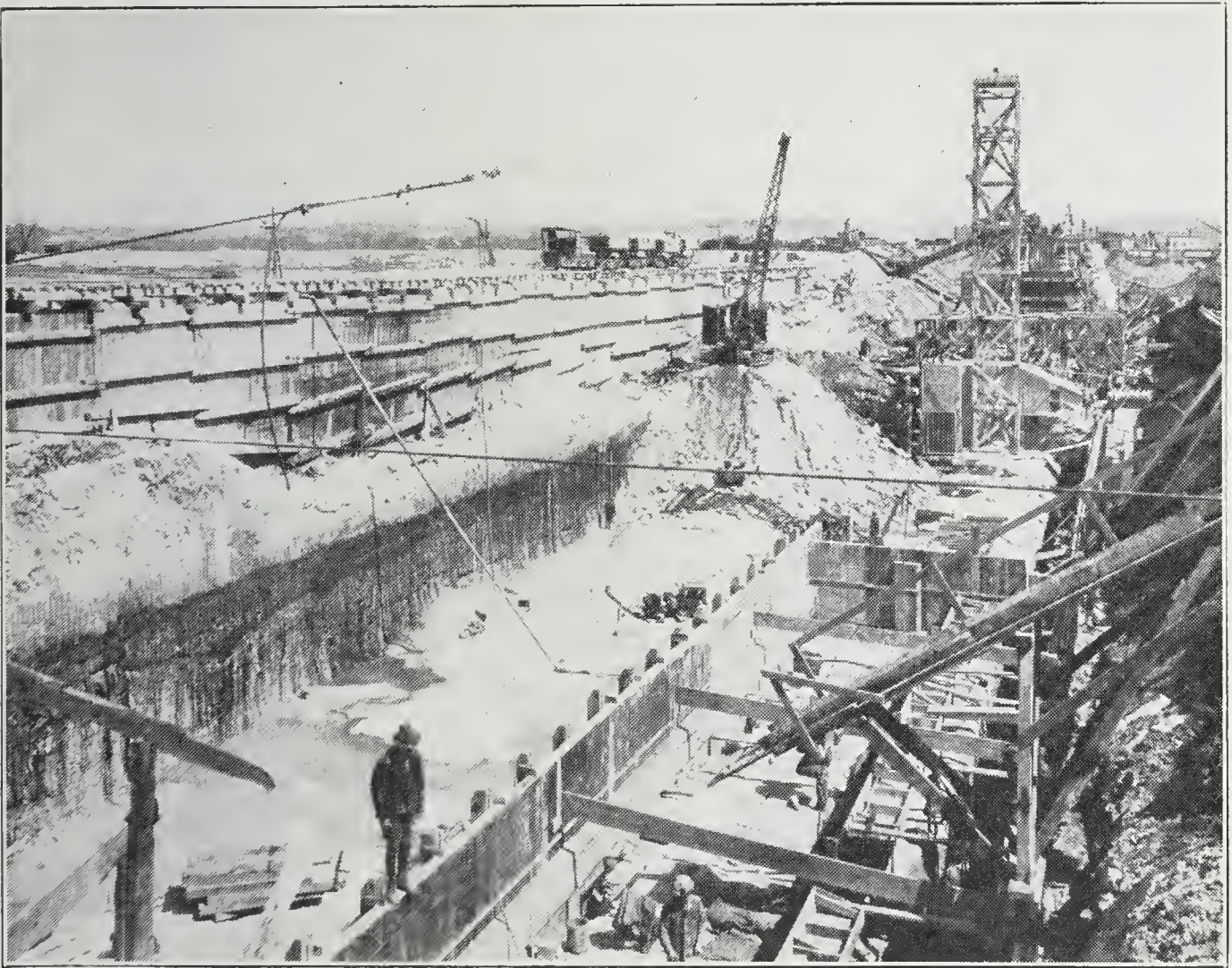
Work within the lower approach cofferdam was discontinued from the latter part of November until the following May, due to flooding from a break in the coffer.



## COFFERDAMS.

The cofferdam around the lower approach, the construction of which had been discontinued the previous fall, was carried to completion in July with a top elevation of about 453.0. Excavation within the area was carried on until the cofferdam broke on the 3rd of October. Repairs were made at once and while preparations were under way for the resumption of the excavation, another break occurred on the 19th of October. This break was in turn repaired and work was again under way when another break occurred on the 27th of November.

No further efforts were made in the way of repairs until May, 1928, when the cofferdam was repaired and pumped out. It failed again on

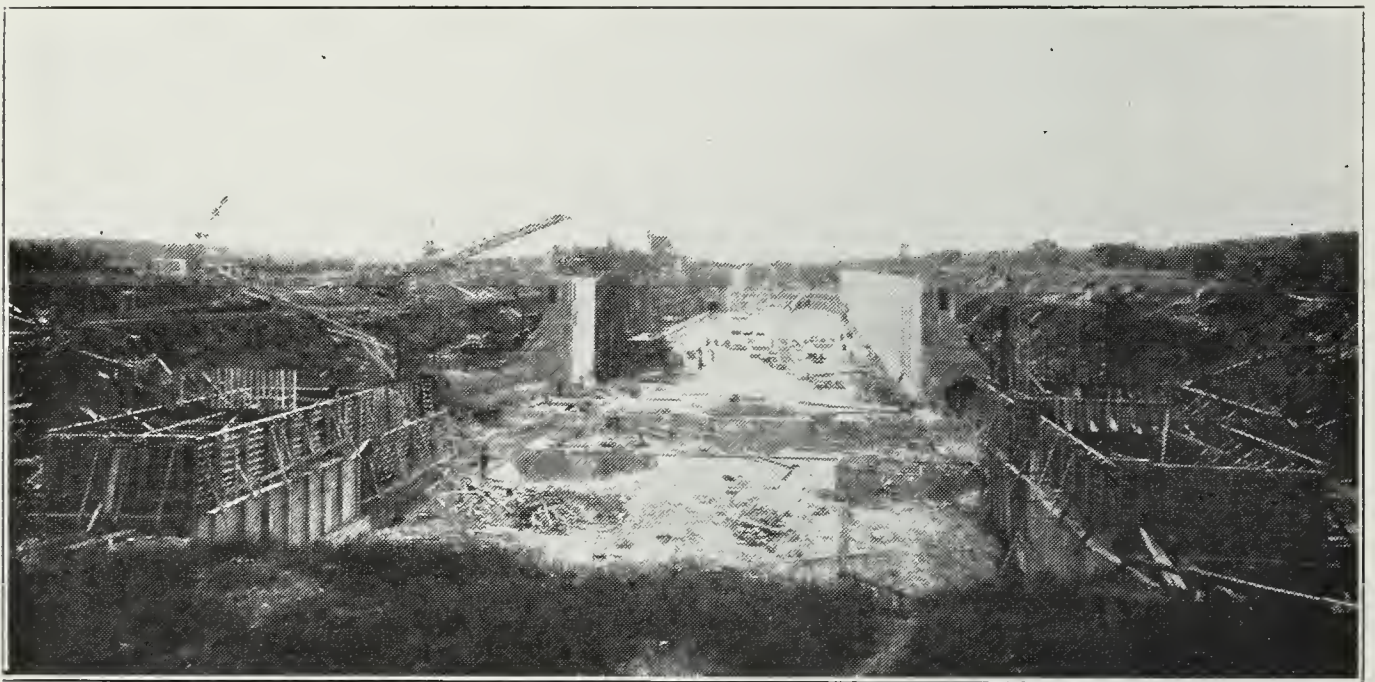


First Section River Cofferdam Starved Rock view from southeast corner looking northwest, April 27, 1928.

June 6th, submerging the excavating machine belonging to the subcontractor. The crevasse was closed and the pit was pumped out sufficiently to allow the removal of the excavator. It was again flooded and the construction of an additional coffer 6 feet wide completely enclosing the old coffer and placed about 3 feet therefrom, was started. The coffer was practically all strung and partially filled, but on the night of the 19th while filling was in progress about 200 feet of the lower end of the river arm fell outward into the river. The impact from dumped filling caused the overturning. The overturned portion was repaired by building a crib of timber and brush on top and filling with earth. The enclosed area was pumped out at the end of the year.



The construction of the first section of the river cofferdam was started in August by the construction of earth levees on the portion on shore. The erection of the box coffer was started in September and both upper and lower arms were extended to and on the island in the river and pumping was started in October to unwater the area between the island and the north bank. The entire structure was completed on November 30th. The area enclosed the balance of the head gate sections, the ice-chute and two complete taintor gate sections. In the meantime a new levee cofferdam had been constructed by dumping earth from the trestle which connected the lock end of the head gate section with the east levee of the lock area. This levee was to prevent flooding of the lock area. On December 19th the earth levee connecting the down-



View of Starved Rock lock looking east from the west embankment. The holes in the side walls of the lock are 12 feet high and provide channels through which the water flows into and is discharged from the lock chamber.

stream arm of the coffer with the shore levee broke by undermining. No particular damage was done and break was repaired and work started inside the coffer on the 30th. On January 23d the outer, upstream corner of cofferdam collapsed by current action washing out the filling. The top portion of the filling was frozen and prevented a settlement which might have stopped the break. This break was repaired and the pit was unwatered on February 13th. There was no further trouble to the end of the year.

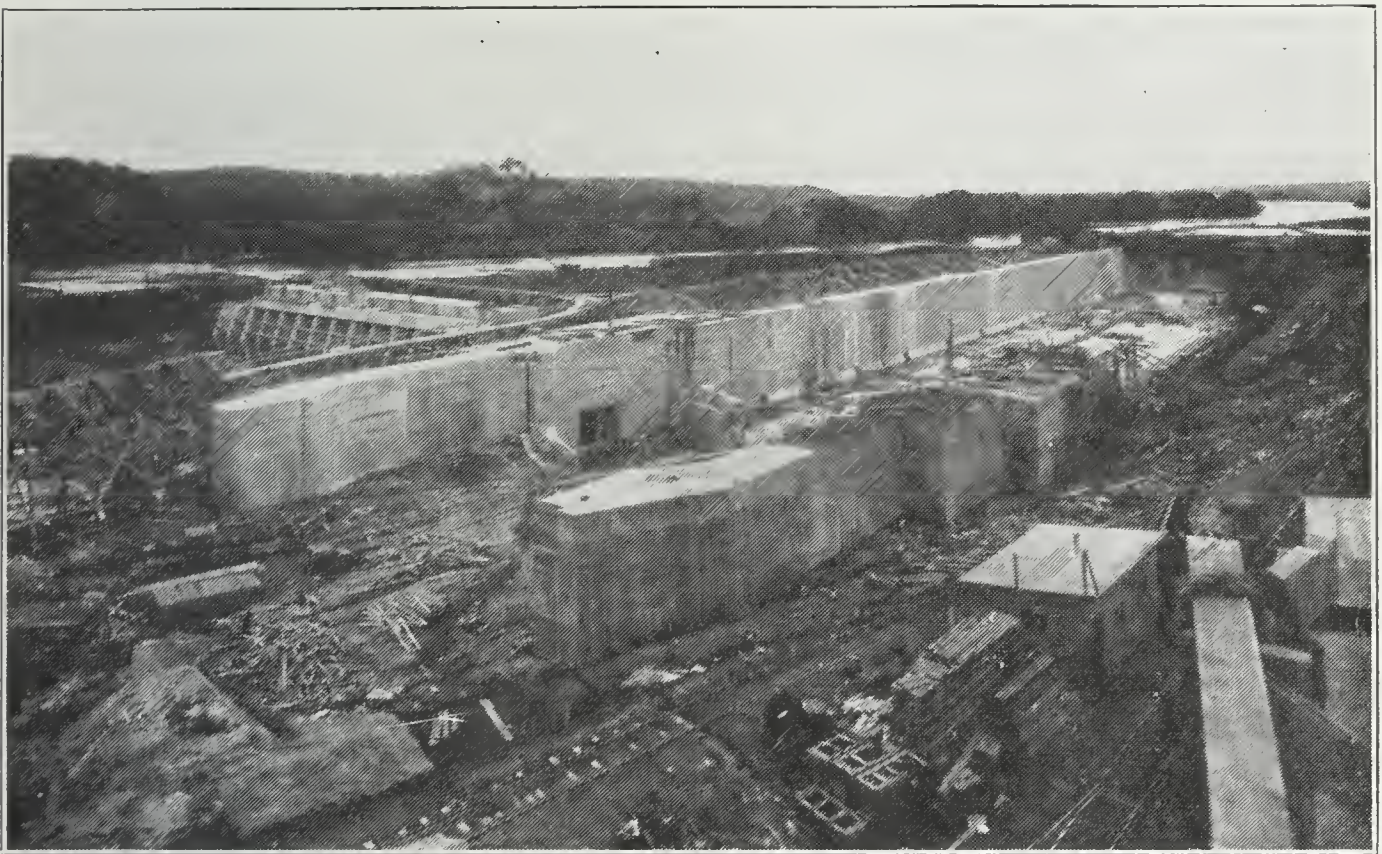
#### CONCRETE.

Concrete operations under way at the beginning of the year were carried on continuously during 1927 until interrupted by cold weather in December. During the winter months repairs were made on the mixing plant and the Blaw Knox steel forms, which had been used for the chamber walls, were dismantled and shipped to the Blaw Knox Co. Operations were resumed in March, 1928, and carried on continuously until the end of the year.



Progress during the last half of 1927 was excellent. On July 1st there had been placed a large portion of the headgate concrete, within the original levee enclosure, and some few sections in the lock around the upper gates on both walls. Blaw Knox steel forms were erected for the straight chamber wall sections and were available for use in July. A double crew was placed in operation in August and the progress was rapid from that time on, resulting in the completion of the lock proper by December with the exception of two floor slabs in the upper gate bay. A portion of upper approach guide was also placed.

Operations from March to the end of June were principally in the headgate and dam sections, the final result for the year being the completion of all lock and upper approach wharf concrete, the completion of the headgate and ice chute, the completion of three taintor gate weirs and the partial completion of three taintor gate piers.



Construction work on Starved Rock Lock and Dam, general view of concrete work from top of mixer plant, October 7, 1927.

#### CONTRACT NO. 7—STEEL WORK.

A contract for the construction and erection of steel work at the Starved Rock Lock and Dam, consisting of lock gates and valves, drop gates for the headgate structure and Taintor gates for the dam, etc., was let to the Independent Bridge Company of Pittsburgh, Pa.

The field work started on May 28, 1928, by the receipt of working equipment. During June five cars of equipment were received. One unloading derrick was erected and a handling derrick was partially set on the lock wall. A compressor was set up and an office and tool shed were erected. Twelve cars of miscellaneous steel were received and unloaded. Hollow quoin casings, already in place, were lined up ready for backing with lead alloy. Oak sealing timbers were bolted to the headgates.



## VALLEY ROAD FILL ACROSS LELAND SLOUGH.

In connection with the Illinois Waterway construction and the proposed raising of the water by the Starved Rock Dam, it was necessary to raise the grade of a portion of what is known as the Valley Road west of Ottawa to bring it above the proposed pool elevation.

The contract for this work was let to Wilson & Company on March 27, 1928, and work started the same day. The only available material for filling was from the waste piles of a gravel plant about one mile away.

A gasoline shovel was installed, some automobile dump trucks were secured and the material was hauled to site. There were about 20,267 cubic yards of material handled in such a manner that traffic was maintained over the fill at all times.

In addition, a reinforced concrete culvert, from the Illinois Highway Department's standard designs with an opening 10 feet wide and 9 feet high was constructed under the fill to allow the passage of creek water. The work was completed on May 31, 1928, for a total cost of \$18,414.11.

## MAINTENANCE AND REPAIRS TO ILLINOIS AND MICHIGAN CANAL.

## COLUMBUS STREET BRIDGE.

The construction of a new highway bridge over the Illinois and Michigan Canal, at Columbus Street, Ottawa, Illinois, was under way at the beginning of the year, having been completed except floor and locking and operating devices. The floor and street car rails were laid early in July, 1927. After some delay in manufacture, the operating and locking devices, with gearing, were received and installed complete on September 16, 1927. The bridge was then turned over to the city of Ottawa for operation.

## REPAIRING CANAL BANK AT ROCKWELL.

The Illinois and Michigan Canal bank, at Rockwell, near LaSalle, Illinois, was in bad condition from a lowered top elevation and a diminished width due to wave wash from the Illinois River back water alongside. A contract was let to Wilson & Company who started operations by way of clearing on October 18th.

A plant consisting of a small gasoline shovel, two gasoline locomotives, dump cars, tracks, etc., was assembled and towed to the site on a barge. Material for filling was hauled from an old coal mine culm pile and spread on the bank. The work was completed on December 13th, with many interruptions from bad weather, about 24,636 cubic yards of material having been hauled.

The net result of the work was to produce a bank about 2,500 feet long, lying to the east from Rockwell, with a top width of about 18 feet and a back slope of 1:1-1/2 to 1. The back slope will flatten from wave wash, but it is thought that a sufficient top width will remain to produce a serviceable bank. The top grade was raised to 3.5 feet above the ordinary navigation stage of water in the canal.

There was also a portion of bank about 700 feet long lying 1,500 feet west of Rockwell which was raised to a uniform grade with a top width of about 10 feet.

#### AUX SABLE AQUEDUCT.

In January, 1928, a contract was let to the Milwaukee Bridge Company, of Milwaukee, Wisconsin, for the construction and erection of a new steel aqueduct on the Illinois and Michigan Canal over the Aux Sable River. In addition to the steel work certain concrete work was necessary for aqueduct seats on the old piers and abutments and for closures around the ends. This work was let to Wilson & Company, of Ottawa, Illinois, as was also the work of laying a pipe by-pass to allow water to be delivered under contract to certain manufacturing companies, at Morris, Illinois.

On January 27, 1927, work was started on the by-pass; about 283 lineal feet of pipe was laid through the canal banks and down through the river bed, the latter being largely in solid rock. A timber dam was built in the canal prism above the aqueduct and water began feeding through the by-pass on February 10th.

The old aqueduct trough was removed, concrete pedestals placed and the steel work was erected to completion in April by the contractor for the steel.

Wilson & Company closed the ends with concrete, removed the pipe by-pass and the impounding dam and turned the water through the new structure on May 13, 1928.

#### GUM CREEK CULVERT.

The construction of a new culvert under the Illinois and Michigan Canal, at Gum Creek, Marseilles, Illinois, was placed under contract with Woods Bros. Construction Company of Lincoln, Nebraska.

Operations began on February 9, 1928, with clearing site and the assembly of plant. It was continued through March, April and May to completion on the 31st.

It involved the excavation of the canal banks and the culvert pit, the removal of the old steel culvert, the construction of the new concrete structure; the backfilling and reconstruction of the canal banks, and the straightening of the creek entering the culvert. In addition, a cofferdam was constructed in the canal prism above the aqueduct to maintain water supply contracts.

On May 24th the cofferdam was cut, allowing the canal water to pass over the culvert and the canal was available for use on the 27th.

#### PAINTING LA SALLE AQUEDUCT.

In the latter part of March, 1927, the work of sand blasting and painting the steel aqueduct on the Illinois and Michigan Canal over the Little Vermillion River, at LaSalle, was let to Wilson & Company.

The plant belonging to the State was assembled and the mud and debris was cleared from the aqueduct, but owing to bad weather there were no operations until the 21st of the following month, when operations were resumed.



The steel work on the entire inside, the vertical outside surfaces and on some badly rusted places on the floor beams was thoroughly cleaned by blasting and was painted two coats of black "Valdura" Gilsonite paint. The painting was done by compressed air, but as a matter of comparison of methods, a small surface on the inside of the aqueduct was painted by hand.

The work was completed on June 1, 1928, and all plant and equipment was removed from the site.

## CONTROL OF STREAM POLLUTION.

By M. C. SJOBLÖM, *Sanitary Engineer*.

After over fifteen years of continuous service with the State in various departments, but all the time on work covering stream pollution, it seems to the writer, that no undertaking of the State can be of greater benefit to the rank and file of its citizens than that of using its authority and power to maintain its streams and lakes in as clean and safe a condition as can reasonably be asked. By this I do not mean returning the streams or bodies of water to the state of purity which existed years ago for that would be attempting the impossible, but to reclaim some of the streams which have now become little less than open sewers, and to prevent undue pollution on such streams as have remained in fair condition.

### SOME PERTINENT FACTS.

In attempting to prevent undue pollution and to reclaim some of the streams now grossly overloaded with various wastes, it is necessary to take into consideration a large number of pertinent facts, among others the following:

It is necessary to consider the nature of wastes causing or threatening pollution; to take into account the quantity of wastes and also the dilution available in the stream or body of water to receive these wastes. It is also important to know whether or not the stream passes through a built-up community or through a sparsely settled region. The nature of the stream and the uses to which it is put are other important factors which must be considered.

It is safe to state that domestic sewage, that is, the house wastes from the cities, villages, institutions or individual homes have been responsible for the bulk of the pollution of our streams to date. However, it might be well here to emphasize the fact that industrial wastes of various kinds are playing a large part in stream pollution in this, as well as in other states, and to date treatment of these waters has not received the attention given to that of domestic sewage. The State as a whole has come to realize that the domestic wastes from the various communities should receive some treatment and accordingly treatment has been provided in hundreds of cases. On the other hand, the industries as a whole have not shown equal effort toward meeting their similar obligations. But even the industries are beginning to show more interest in their problems of waste disposal than was shown some years ago.

## CIRCUMSTANCES ALTER CASES.

In connection with its work of passing on plans for the proposed treatment works for domestic sewage, the State must take into consideration a number of conditions, some of which have been mentioned. It would no doubt be considered unreasonable, at the present time at least, to demand of a small town on a large stream the same degree of treatment as is demanded of a similar town on a small stream affording little or no dilution. To the enthusiast who thinks of streams only in terms of their pristine purity, dilution may be of little value. However, in taking conditions as we find them, dilution must be considered as an important factor in the disposal of sewage. Where adequate dilution is available, sedimentation or fine screening may well be all that can reasonably be required. However, where dilution is inadequate and the stream or body of water receiving the sewage is critically located, further treatment is necessary to prevent nuisance or other damage.

## SEWAGE TREATMENT PLANS.

Not only is it desirable that the State be prepared to pass intelligently on the degree of treatment necessary, but it must also be prepared to study the detailed plans submitted and see that they conform to good practice. There are, of course, engineers who are well prepared to design sewage treatment works; but it appears past experience that many engineers who attempt this work have an insufficient knowledge of the subject and often the plans submitted do not provide means for as efficient treatment as might be provided, at little or no additional cost, had the engineer fully understood the art of sewage treatment. In the majority of the plans submitted to the State for consideration it is found necessary to require radical changes before approval can be given for their use. On occasions it has been found necessary to suggest that complete new plans be prepared rather than to suggest the salvaging of the few satisfactory features shown.

## PROPER DESIGNS IMPORTANT.

Even though the State retains agencies to check the plans for sewage treatment works, it would be to the distinct advantage of the communities proposing such works were they to secure the services of only such engineers as have by training become specialists in the art of sewage disposal. That this is not done to a greater extent is largely due to the fact that the average layman does not realize the numerous details involved in the proper design of a plant, and their importance in the efficiency of the plant. He too often thinks the civil engineer with a general practice, who perhaps is doing creditable work in looking after the community paving, is qualified to do the work. Often, too, no doubt, he is led to believe that the charges for the services of an expert would be excessive. It is a fact, however, that, as a rule, the sanitary engineer, fully qualified to lay out and supervise sewage disposal works, charges no more than his less qualified competitor and often his superior knowledge in this line of work would save considerable money to the community. It should be remembered too that the State can at best insist



only on such changes as are necessary to insure reasonable efficiency of the plant and can not well demand all the minor changes in the various details which would tend toward making the plant more efficient.

#### STATE SUPERVISION AIDS COMMUNITIES.

In the work of passing on plans the State has saved thousands upon thousands of dollars to communities, where without State supervision, very inefficient and in some cases worthless units would have been installed, for the inefficient or practically useless plants would have cost as much or more than properly designed plants.

Among the industries which are polluting our streams and bodies of water are gas and coke plants, tanneries, paper mills, starch works, steel works, rendering plants, packing houses, dye plants, asbestos works, creameries, gelatine factories, cheese factories and canning factories. The wastes from these industries and others do not usually equal in volume the domestic sewage from nearby communities. However, most of the industrial wastes here represented, make far heavier demands on the streams, unit for unit of the wastes, than does domestic sewage, and the wastes from a single plant can often create objectionable conditions in nearby streams.

Of the industries mentioned, gas plants have perhaps done as much damage as any, especially so far as fish life is concerned. The objectionable wastes are principally tar, some light oil and other light liquors. Until recently, little effort was made by the gas companies to save the last traces of tar and oil and as a result the bottom of a number of streams were filled with accumulations of tarry deposits. These deposits not only made the stream beds unfit for fish life, while the wastes were entering, but impregnated the bottom and banks to such an extent that years later large oil blotches are raised by stirring the bottom and tar adheres to any object which penetrates the stream bottom as well as banks.

#### DANGER OF GAS HOUSE WASTES.

A few years ago the State had occasion to investigate the killing of millions of fish in Fox River, immediately below Aurora. Careful investigation indicated conclusively that the local gas company was responsible. In this case it was not the normal plant operation which caused the trouble, but a special situation, namely the use of a temporary apparatus for caring for the wastes, while changes were being made in the treatment plant proper. Only a few days operation of this temporary plant practically exterminated fish life for several miles in the river.

It is not difficult to convince the average layman that gas house wastes should not be permitted to enter a stream, for here the very nature of the waste indicates its objectionableness. On the other hand, it is often quite difficult to convince him that a sparkling clear effluent, such as comes from steel mills where pickling is undertaken and iron sulphate is recovered, may be fully as damaging to fish life. And only too often it is quite difficult to make him understand that wastes from canning factories or milk wastes are dangerous to fish life. But in the case of

these three types of wastes the damage does not lie in the actual composition of the fresh wastes, but in their great demand for oxygen. As soon as they enter a stream they begin taking on the oxygen necessary for their aerobic decomposition, and if the stream is unable to supply the demand and still have a certain amount of dissolved oxygen in reserve, the result is that fish life is exterminated and is again possible only at a point down stream where the wastes will have become stabilized to a point where their demands for oxygen have been reduced and the stream has again taken on sufficient new oxygen.

The general public is demanding, more and more, that treatment of the wastes from the various industrial plants of the State be provided. It is safe to state also that those in charge of these industries are becoming more reconciled to this necessity and in many cases are carrying on experiments of their own, or in conjunction with the State, in the hope of finding adequate and reasonably priced process for treating these wastes. And the cost of treatment processes must remain a big factor in the fight to end industrial waste pollution, for in many cases the cost of adequate treatment works may go far toward deciding whether or not an industry is to be profitable.

#### COST OF TREATING INDUSTRIAL WASTES.

In connection with the discussion of the cost of treating industrial wastes it might be of interest to mention the situation found in the canning industry. The wastes in the majority of cases are from corn and peas, but there are also a few plants canning beans, pumpkins and tomatoes. Contrary to the general belief, the wastes from these plants make exceedingly heavy demands on the streams per unit of waste entering, compared with raw domestic sewage. But these plants operate as a rule but a few weeks per year and naturally it is quite necessary to keep down the cost of treatment works to a minimum. Were the plant to operate the year around it might be reasonable to require finished and extensive artificial filter units. Under existing conditions, however, it has been found satisfactory, where soil conditions were suitable, to require inexpensive broad irrigation units using sufficient areas of the natural ground to take up the wastes. This means of disposal, alone or connected with fine screening, sedimentation or chemical precipitation, have served most of the plants in the State. Other methods have been employed elsewhere and will undoubtedly be used here later. But the main point to be brought out is, that the State must take into consideration not only the treatment necessary but also the cost involved and whether or not it is justified. Often it is a matter of securing improved conditions at a warranted cost to the industry rather than demanding a prohibitive expenditure which would result only in the industry closing its doors and moving to a point more favorably situated. Often the value of the plant to the community may well be considered of greater importance than the temporary damage to a nearby water course.

After the State has utilized its powers to the end that certain municipalities or industries have provided treatment for their wastes it has still another function to perform. For a large part of the work is left in the form of making investigations to ascertain if the plants installed



are being properly operated. Only too often, a municipality or industry seems to feel it has done its full duty once the treatment plant is installed, and forthwith decides to spend the least possible amount of money for adequate supervision and care. Soon complaints arrive, informing the State of the bad conditions and then it is necessary to have investigations made and if necessary bring pressure to bear to have the plant properly operated.

## EMERGENCY FLOOD RELIEF—ILLINOIS DIVISION.

Report of L. C. CRAIG, *Division Engineer*.

The following is a report covering the operation of the Illinois River Division for the year ending June 30, 1928:

### LOCATION.

The work of this Division has consisted in the repair of levees along the Illinois River from Naples to Henry, a distance of about 130 miles and along the Sangamon River and its tributaries, the North Fork and Salt Creek from the mouth of the Sangamon to a point on Salt Creek about 10 miles west of Lincoln. Little work has been done south of Naples as it appears that districts and owners south of that point have been able to repair their own levees.

### ENGINEERING ORGANIZATION AND METHODS.

Nearly all contracts for levee repairs have been let on the yardage basis which has necessitated the survey of all damaged levees.

The work has been done by an organization consisting of the division engineer and his assistant and two field parties, each consisting of one instrumentman and two rodmen. In some cases the districts or owners have employed their own engineers who have cooperated with this office.

In all, about 150 miles of levees have been surveyed, of which about 40 miles have been done by local engineers. In addition to the above, many "breaks" have been cross-sectioned.

On account of the wide distribution of the various contracts much traveling has been necessary. Many contracts were located away from the railroad and in view of the difficulty and delay in reaching such points the automobile was relied upon in most cases for transportation.

Office work has consisted of the necessary platting of cross-sections and profiles to determine quantities. Considerable work has also been done in the compiling of sketch maps of the different districts for record purposes.

### DISTRICTS SUPPLEMENT STATE AID.

Contracts let to date in this Division, number sixty-six and amount to the sum of \$376,512.23. Of this amount about two-thirds has been granted on the basis of 100 per cent aid and one-third on the basis of partial aid varying from 60 per cent to 80 per cent. The above sum, therefore, after adding the portion contributed by districts and owners, represents about \$415,700 actually used in restoring levees to their original grade and section.

## EQUIPMENT AVAILABLE.

The equipment in use during the past year consists of two large floating clam shell dredges, one dipper dredge and several small drag lines. In addition it was found possible to use the U. S. Government fleet consisting of dredge and dump scows for some work for which it was especially adapted. About 20 per cent of the work has been done by teams and wagons or teams and scrapers.

At the commencement of the work the large clam shell dredge of the Edward Gillen Dock, Dredge & Construction Company was at work for the Banner Special Drainage and Levee District and this dredge soon became available for the State's flood relief work.

Much of the levee repair work was suitable only for floating dredge and it soon became apparent that an additional large dredge was needed. At this juncture the State was fortunate in securing the large clam shell dredge of the McWilliams Dredging Company. This dredge was towed up the Mississippi and Illinois Rivers from New Orleans, and after working for a short period on the new Beardstown levee, became available for flood relief work in December, 1927.

## PROGRESS REPORTED.

Sixty-six contracts have been signed to date, of which forty-one are completed and twenty-five are uncompleted.

At the present time applications for repairs which may be allowed amount to \$610,129.08, of which contracts have been let for \$376,512.23, leaving future contracts to be let amounting to \$233,616.85.

The following is a classification of the work of this Division now under contract giving average unit costs:

Class of Work.	Quantity cu. yds.	Av. Cost per cu. yd.	Total Cost.
Teams and scrapers.....	216,694	0.285	\$ 61,172.19
Teams and wagons.....	23,102	0.515	11,903.70
Dragline .....	443,824	0.248	106,879.15
Floating dredge .....	643,514	0.216	139,015.75
Driving piles at breaks.....	.....	....	5,635.60
Piling and miscellaneous materials.....	.....	....	8,608.20
Rock rip-rap .....	.....	....	116.99
Emergency work, sand bagging to hold levees under repair against high water	.....	....	5,114.25
Team work by force account.....	.....	....	12,000.89
Dragline by the hour (emergency work).	.....	....	7,620.00
Floating dredge by the hour (emergency work) .....	.....	....	10,125.00
Government fleet West Matanzas.....	.....	....	8,320.51
Total .....			\$376,512.23

The following is a statement showing the distribution of flood relief work by counties:

Counties.	No. of Contracts.	Amount.
Cass .....	13	\$45,641.78
Mason .....	13	27,238.32
Pike .....	5	44,392.07
Morgan .....	3	7,472.84
Menard .....	3	12,269.40
Fulton .....	9	97,400.64
Schuyler .....	5	33,448.90
Brown .....	2	18,411.00
Scott .....	3	1,859.00
Peoria .....	3	75,304.58
Tazewell .....	2	4,563.75
Logan .....	3	6,381.95
Sangamon .....	1	1,368.00
Christian .....	1	960.00
	66	\$376,512.23



## PROBABLE FUTURE WORK.

It is probable that it will be necessary to let about 20 more contracts. It is expected that most of this work will be completed by January 1, 1929. However, on account of lack of available equipment and other reasons it is possible that two or three contracts must wait over until the spring of 1929.

## OBSERVATIONS RE LEVEE FAILURES OF 1926 AND 1927.

Of 47 drainage and levee districts which were protected from Illinois River overflow between Henry and Grafton, 23, or approximately 50 per cent, were flooded in the fall of 1926 or the spring of 1927.

The writer during inspection trips, in connection with the work of flood relief, has personally inspected many of the levee breaks and has interviewed engineers and commissioners concerning the immediate causes of these breaks.

The following data, which may be of interest, was obtained:

Of the 23 districts, 9 were flooded from breaks in levees along creek diversions, caused by the excessive local rainfall in September, 1926. One held in the fall, but was flooded from a creek levee break, caused by a local storm in May, 1927, and the remaining 13 districts were flooded in the fall of 1926 by breaks or overtopping of the main or Illinois River levees.

Of the 9 districts mentioned above as flooded from creek levee breaks, 3 were repaired during the winter of 1926-27 and held out the spring flood of 1927, 3 were repaired during the winter and broke again in the spring, and 3 had additional breaks in their river levee, which prevented repairs being made in time to keep out the spring flood.

Of the 23 districts flooded, in only 4 is there a suspicion that the break occurred where the levee section had been weakened by burrowing animals, and in these cases eventually the levee would have been overtopped.

In two districts levees broke where constructed over old lake or slough beds, due to insufficient section and in one district where the levee was built across the channel of a creek and did not break, a bad slide occurred and it was necessary to spend a large sum in sandbagging, etc., in order to hold out the water.

While nearly all levee breaks occurred in the fall of 1926, the greatest damage to the levees themselves was caused by wind storms in the spring of 1927. Many districts having been unable to complete their repairs were flooded continuously during the winter months and their levees badly damaged by wave action.

It was noted that the levees of many districts were being allowed to grow up in brush and timber and in only a few cases was any attempt being made to cultivate a protective growth of grass or sod. It is not known, however, that a growth of timber on a levee contributed in any way to a levee failure during the flood of 1926 and 1927. On the contrary, in some cases small timber growth on the outside slopes and berm of levees afforded some protection from wave action where otherwise, due to absence of any timbered foreshore, no protection existed.



In some cases, the overbank floodways of creek diversions were found to be covered with a thick growth of willows and small timber, so as to greatly interfere with their flood carrying capacity. While it is not known that any levee breaks resulted directly from this cause, it is possible that in some cases the growth of timber in floodways was a factor contributing to some of the creek levee breaks of September, 1926.

In general it may be said that:

While levee sections should be increased, especially where over 15 feet in height, the levee failures during the floods of 1926-27 were caused directly by overtopping of the levees and not by a weakness of section due to poor engineering design.

While not all levees and floodways along the Illinois River were properly maintained, this fact did not contribute in any great degree to the levee failures of this flood.

### EMERGENCY FLOOD RELIEF—MISSISSIPPI DIVISION.

Report of GEORGE F. PATRICK, *Division Engineer*.

The following is a report covering the operation of the Mississippi River Division in administering flood relief for the year ending June 30, 1928.



Sand boils inside levees at Cairo, Ill., showing use of sand bags to wall up the flow.

#### LOCATION.

The work of this Division, with offices located at Anna, Illinois, has consisted in the repair of levees along the Mississippi River, the Cache River, the Kaskaskia River, the Big Muddy River and Clear Creek, covering a distance of about two hundred miles, actual work being done in eight counties.

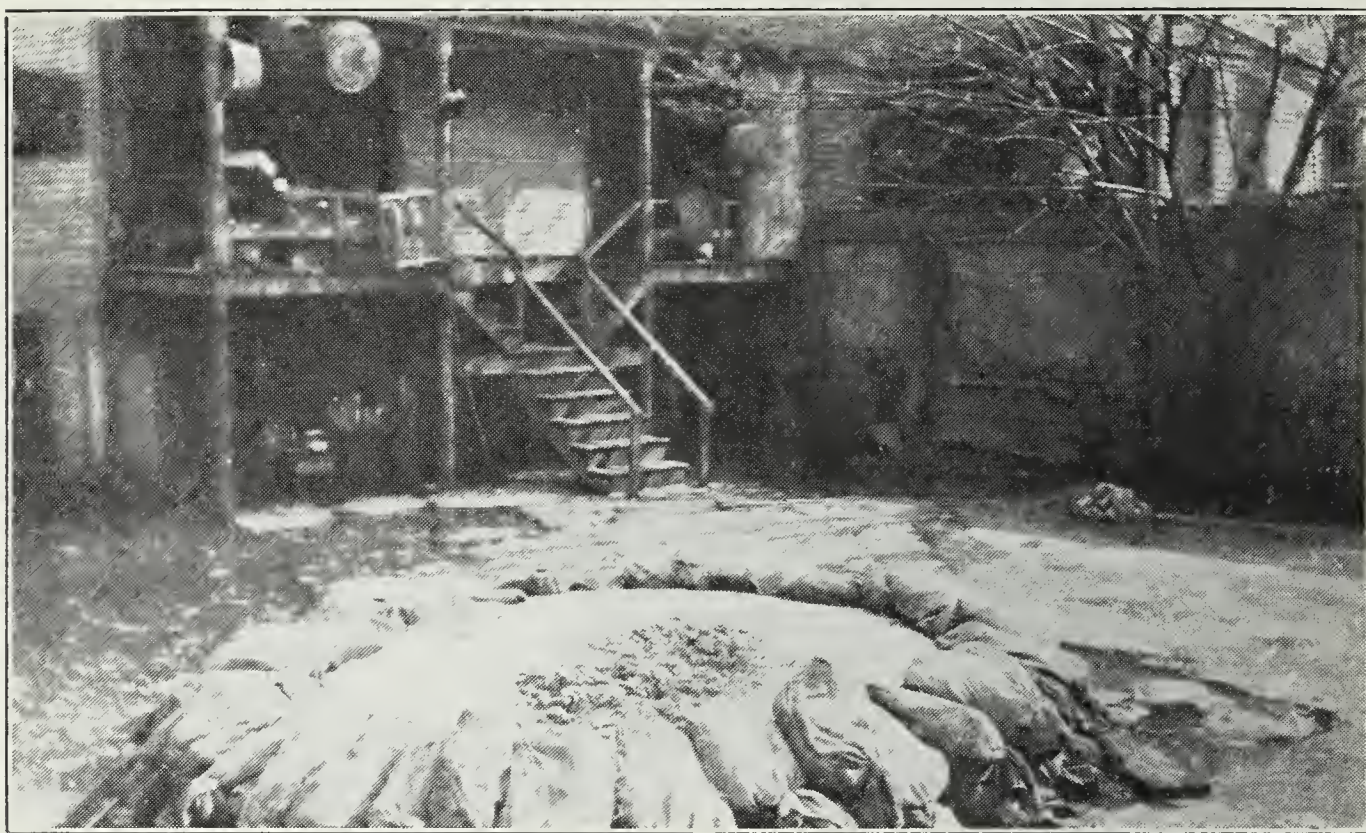


## METHODS.

The work has been carried on under the supervision of the Division Engineer aided by the Assistant Engineer and such field parties and inspectors as have been found necessary. In some cases the districts hired their own engineers who did the necessary field work in cooperation with this office. Most of the office work, which consisted of plotting of cross sections, computation of yardage and the making of maps, was done by the Assistant Engineer. Cost estimates originally filed for this Division amounted to \$919,530, but the work has been pretty well taken care of through contracts amounting to \$535,801.

## BENEFITS OBSERVED.

The writer has been able to observe at first hand the benefits resulting from the application of relief to the flooded areas. A majority of the inhabitants living in the flooded areas lost one or two years crops,



Sand boils in rear yard at 224 15th street, Cairo, Ill., flood of 1927. These sand boils are at least 1,000 feet back of the levee.

and in many cases lost their buildings and stocks, and also were in a bad financial condition. The restoration of the levees at State expense enabled them to obtain credit and to start again their farming operations. The letting of contracts locally gave work to the farmers and their teams and helped them to get on their feet.

## PROGRESS REPORT.

Thirty-four contracts for work in this Division amounting to \$535,801.00, have been signed to date, of which twenty-seven are completed and seven are uncompleted. The uncompleted contracts will be finished about the first of September, 1928. No new contracts are anticipated at the present time.



The following is a classification of the work of this division now under contract giving average unit costs:

Class of Work.	Quantity Cu. Yd.	Av. Cost Per Cu. Yd.	Total Cost.
Teams and scrapers.....	334,707	\$ .235	\$ 88,546.00
Teams and wagons.....	45,147	.667	30,111.00
Dragline .....	465,691	.236	109,889.00
Industrial R. R. haul.....	475,000	.50	237,500.00
Lump sum contracts.....	.....	.....	53,500.00
Team work by force acct.....	.....	.....	13,924.00
Concrete culvert construction.....	66.6	35.00	2,331.00
Total .....			\$535,801.00

The following is a statement showing the distribution of flood relief work by counties:

Counties.	No. of Contracts.	Amount.
Alexander .....	9	\$308,738.38
Pulaski .....	2	20,363.84
Union .....	9	96,961.78
Jackson .....	5	47,957.00
Madison .....	2	13,200.00
Randolph .....	3	17,000.00
Monroe .....	3	20,750.00
Fayette .....	1	10,830.00
	34	\$535,801.00

## ENCROACHMENTS—OBSTRUCTIONS—PERMITS.

Report of W. G. POTTER, *Drainage Engineer*.

### ENCROACHMENTS ON CAHOKIA CREEK, AT EAST ST. LOUIS.

July 1927, an investigation was made in regard to the present condition of Cahokia Creek, at East St. Louis.

This stream drains much of the territory of the East Side Drainage and Levee District and the hill waters reaching that district. It follows a very tortuous course through the stockyards and railroad district of East St. Louis and empties into the Mississippi in the Southern part of the city.

The Cahokia is crossed by 27 bridges inside the city limits. Originally these bridges consisted of from 8 to 12 spans of trestle, but in many cases, instead of being renewed or rebuilt to the original size, the stream bed has been encroached upon until at present they consist of only two or three spans. Even these narrow channels have been still more restricted and obstructed by cross braces, water and sewer pipes, old piling left in place until now every little channel space is left. In consequence of these obstructions and the encroachments between bridges, in 1927 several square miles of land and several highways were badly overflowed and damaged.

Photos were taken at many of these bridges and encroachments.

In talking over the situation with Mr. John D. Johns and Mr. Putnam, President and Engineer, respectively, of the East St. Louis Drainage and Levee District, I was informed that a project was being agitated to straightened the channel and make a new outlet for the Cahokia, by which many of the bridges would be eliminated and the situation much improved. This depends, however, on agreement between



the district, the stockyards and the railroads as to property rights and expense and is still pending.

The proposed change would be a direct benefit to all interests and was recommended by this Department.

#### ROCK RIVER SHORE LINES AND ENCROACHMENTS.

Many trips were made to Sterling, Dixon, Rockford, South Beloit and other points, often in company with the U. S. Associate Engineer for that river.

Shore limitation lines were given in numerous places requested by property owners who, in many cases, erected walls on the line given, thus insuring absence of further encroachments in the future. In Rockford, one shore line given necessitated the removal of part of a one story concrete building, which was erected some years ago without permit and in spite of a forbidding order by the U. S.

In this case suit was brought by the U. S. for removal of this encroachment. In order to obtain a shore limitation line for a new building, the owners agreed to remove the encroaching building and the U. S. action is taken out of court.

In another case at Rockford a shore line nearly a half mile long was given and will be marked by a wall.

#### FOX RIVER SHORE LINES AND ENCROACHMENTS.

Similarly numerous trips to points on the Fox River were made to investigate encroachments or to establish shore limitation lines.

Outstanding among these were the lines given at Aurora by which the C. A. & E. Railroad is enabled to construct a new terminal and a new entrance along the river instead of on a very busy street. In this case, in return for allowing an encroachment on the river bank, the railroad is to remove a large island in the river. The result will be a channel improved in flood capacity, the removal of a very unsightly and obnoxious back yard shore line, and a new terminal for the city which will add much to the assets of the town.

At Elgin also a new shore line has been given, enabling a new terminal for the same road. Shore lines are also being given on the east side of the river and it is expected that a wall will be built by the C. M. & S. P. Railway extending about a half mile along the river.

Encroachments at various points on the Fox have been investigated and stopped. It is the policy of the Department whenever possible to insist on a wall being built on the line established and by doing so avoid further encroachments in the future.

#### DEVELOPMENTS IN THE LAKE REGION.

With the advent of the automobile a great change is coming to the lake region of northern Illinois.

The city dweller of former days seldom left the city except by rail, and suburban homes were within a circle of very limited radius.

With the automobile the circle is vastly enlarged and is constantly continuing to widen. City residents are reaching farther out each year for homes, for pleasure and relaxation from city life.

In consequence, the beautiful rivers and lakes of our State are becoming more and more valuable each year for summer homes and for recreation. Not only is this true of our lakes and rivers, but in many places dams are being erected in the small streams, thus turning unsightly swamp lands into beautiful lakes and changing the surrounding property into home sites of great value. In other places channels are being cut from the lakes or rivers which drain the swamp lands and make the ground previously of no value into good home site property accessible by either water or highway.

Improvements of this kind are constantly being approved by this Department, thus both adding to the comfort, pleasure and health of our citizens and also adding much to the taxable assets of the State.

#### PERMITS ISSUED.

The following is a list of permits issued during the year and its comparison with those issued during the previous year.

#### FORMAL PERMITS.

	1928.	1927.
Docks, piers, retaining walls, etc.....	57	57
Sewer systems and treatment plants.....	20	39
Tunnels, pipe lines, transmission lines and stream crossings.....	37	40
Dredging, filling, new channels.....	30	14
Bridges .....	45	43
Chicago River channel change.....	0	1
Harbors, intakes and discharges.....	6	11
Dams .....	5	4
Drainage districts .....	5	3
Total formal permits.....	205	212

#### LETTER PERMITS.

Piers, channels, etc., in Fox Lake region.....	48	25
Bridges and culverts on weekly list from Division of Highways...	609	461
Total permits issued.....	862	698

### HYDRAULIC INVESTIGATIONS, SURVEYS ETC.

Report of MURRAY BLANCHARD, *Hydraulic Engineer*.

Hydraulic investigations of miscellaneous problems when presented were made throughout the year. The entire time for several months was devoted to the preparation of plans, tables, charts, and making computations in the compilation of data for the use of the Chief Engineer at the lake level hearings before Special Master Hughes in Washington and assisting the Chief Engineer at these hearings.

Numerous permits pertaining to dams, channels and other matters relative to the levels of inland lakes were issued.

Plans and specifications were prepared in connection with the river channel excavation of The Illinois Waterway.

Compilation of maps for an extensive right-of-way record of the Illinois Waterway was commenced.



FOX RIVER SURVEY FOR LOCATION OF DAM SITE.

An appropriation was made by the Fifty-fifth General Assembly, "For the construction of a dam and lock in Fox River at or near where the river flows from Nippersink Lake..... \$175,000."

It appeared that the most feasible site for a dam to raise the waters of Fox Lake "at or near where the river flows from Nippersink Lake" (if the authorization "at or near" could be construed to intend to contemplate a dam that would raise all of the waters in the Fox Lake chain) would be somewhere in the narrow portion of the river below where it flows from Pistakee Lake.

Accordingly a topographic survey was made in July and August in the narrow portion of the river above the Johnsburg bridge to Pistakee Lake and soundings and borings were made at various sections to test the channel material for suitability as dam sites and foundations.

A map of this survey was prepared. Later the dam below McHenry was repaired and the water level has been maintained above it and in the Fox Lake district at levels that are apparently satisfactory to property owners and all others concerned.

RIVER WORK AT MCHENRY.

The gates of the McHenry lock were rebuilt by Matthews & Tonyan Co., at a contract price of \$525.00, including material.

Negotiations with Mr. Bolger were in progress for a year or more in reference to obtaining an easement on his property for a levee along the right bank of Fox River immediately above the McHenry dam. A preliminary agreement was entered into in October but the final agreement was not executed until several months later so that the work stipulated therein had to be postponed until spring.

Preceding this time there was in place a row of steel sheet piling for fifty feet along the right bank of the river, adjoining the west end of the dam, and a levee embankment of inadequate dimensions extended from the upper end of the sheeting along the Bolger property. The levee protection contemplated steel sheeting to join that in place and to extend sixty feet upstream, and from there to the property line a distance of some 300 feet a line of Wakefield sheeting backed by round piles spaced 10 feet center to center and bolted to a 4" x 10" waling strip. Back of the pile protection it was proposed to build a line to elevation 738.5 Memphis Datum with a 10 foot minimum top width and sloping back for a distance of 50 feet.

Contracts for this work were let to Julius Keg as follows:

Wakefield protection for \$7.20 per lineal foot not to exceed.....	\$2,340
Levee 1,500 cubic yards at 50 cents per cubic yard not to exceed.....	750

Contracts for lumber were made in connection with the repair of the McHenry dam and the prices bid were made applicable to this work. The lumber was thus purchased from local dealers. Steel sheeting was purchased (second hand material) from the Equipment Corporation of America at \$40.00 ton f. o. b. cars Chicago. Julius Keg contracted for the driving at \$2.50 per lineal foot.

The total cost of the Bolger embankment protection works was approximately \$3,700.

## MEYERS BAY BRIDGE.

An appropriation of \$15,000 was made by the Fifty-fifth General Assembly "for reopening of the channel and building a bridge over the channel between Pistakee Bay and Meyer Bay of Pistakee Lake Illinois."

Under this authorization the Division of Highways was requested to submit plans and specifications applicable to this work. A short span, reinforced bridge, with abutments, was called for. Later detail borings and investigations of the bearing material indicated that the ground was not sufficiently solid to support the proposed approach fills of some seven to nine feet in height. Consequently the plans were modified by this office to substitute reinforced concrete bridge approaches in place of the higher portions of the fill with concrete curtains at the ends to hold back the fill material in place of the abutments.

Supplemental specifications adapted to this particular job for use in connection with the standard specifications of the Division of Highways were prepared, the work was advertised and bids were opened on June 20, 1928.

The following bids were received.

Matthews & Tonyan Co., West McHenry, Illinois.....	\$14,168.00
W. H. Shone, Freeport, Illinois.....	17,800.00
C. E. Carson & Company, Chicago, Illinois.....	18,400.00

The contract was awarded to Matthews & Tonyan Company.

## RECONSTRUCTION OF MCHENRY DAM.

The Fifty-fifth General Assembly made an appropriation, of \$10,000, "for maintenance and repair of Fox River Dam, Lock and Fishway at McHenry, Illinois, and for services of custodian for the same."

For carrying out the provisions of a previous Act "authorizing the acceptance by the State of certain land in McHenry County and the acceptances, operations and maintenance of a dam, lock and fishway located thereon," approved June 21, 1923, the Fifty-fourth General Assembly had made an appropriation of \$6,500.

The Fifty-fifth General Assembly also appropriated \$90,000 for repair of Illinois River locks and for all work necessary for the maintenance of navigation and structures on all Illinois rivers under the Department of Purchases and Construction.

With part of the money from each of the above appropriations the reconstruction of the dam, replacement of lock gates and the construction of the necessary bank protections along the right bank of the river at the west end of the dam was accomplished.

## NEW DAMS FOR OLD.

The old dam consisted of a wooden apron on timbers supported by two parallel rows of piling and extending from the lock to the right bank. In front of the entire length of this was driven a row of steel sheeting and bolted to the apron were hinged iron braces spaced 20 feet apart to support flash boards. This timber apron became so rotted and out of repair that the pressure of the water against the flash boards and through the braces was too much for the apron to resist and there resulted frequent breaks in the dam and consequent damage to property.



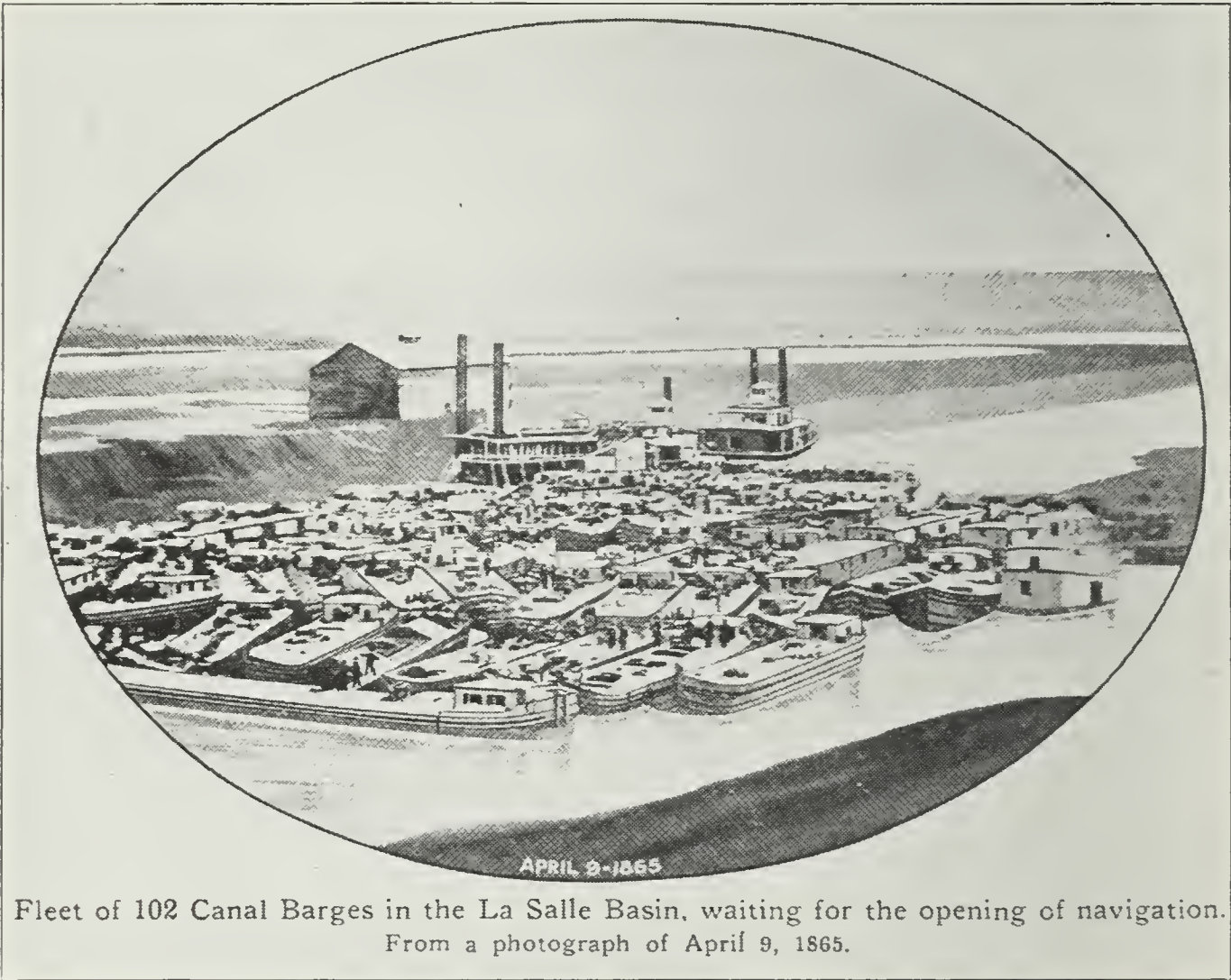
As the most practicable method to put the dam in good condition, it was decided to replace the wooden apron with a substantial one of concrete. The contracts for this work were made on the basis of unit prices as follows:

Concrete, \$7.75 per cubic yard; drive and remove piling, \$3.00 per lineal foot; stone fill, \$3.30 per cubic yard.

These prices included: Removal of the wooden apron, labor bracing Wakefield, labor setting templates, furnish gravel, labor concreting and placing stones.

The total cost, including emergency work resulting from a broken cofferdam, amounted to about \$15,000.

The reconstructed dam is now capable of maintaining a higher backwater level upstream than the banks along the river will hold. To raise the river bank in places upstream from the dam would maintain the stream. However, this capacity is limited to a few inches until such a time as the lock walls and gates are raised.



Fleet of 102 Canal Barges in the La Salle Basin, waiting for the opening of navigation.  
From a photograph of April 9, 1865.

ILLINOIS AND MICHIGAN CANAL.

Report of JOHN A. WALTER, Auditor and Collector.

SUMMARY SPECIAL CANAL FUND AND ACTIVITY REPORT JULY 1, 1927,  
TO JUNE 30, 1928.

Balance on hand July 1, 1927.....	\$53,269.67
Receipts July 1, 1927, to June 30, 1928.....	\$36,397.45
Expenditures July 1, 1927, to June 30, 1928.....	25,763.47
Receipts over expenditures.....	10,633.98
Balance on hand July 1, 1928.....	\$63,903.65

RECEIPTS, JULY 1, 1927, TO JUNE 30, 1928.

Ninety-foot strip, lots and bridge rentals.....	\$16,376.25
Water power rentals.....	12,492.24
Boat house rentals and level licenses.....	27.50
Water pipe rentals and miscellaneous.....	6,440.72
Ice leases .....	795.00
Certified .....	22.50
Tolls and lockages.....	243.24
Total .....	\$36,397.45

EXPENDITURES, JULY 1, 1927, TO JUNE 30, 1928.

Appropriation for I. & M. Canal.....	\$25,763.47
Appropriation for Illinois rivers.....	45,600.48
Appropriation for aqueduct over Aux Sable River.....	17,007.03
Appropriation for culvert at Marseilles (Gum Creek).....	17,000.00

ILLINOIS AND MICHIGAN CANAL EXPENDITURES, JULY 1, 1927, TO JUNE 30, 1928.

Salary locktenders and officers.....	\$ 8,880.00
Labor pay rolls.....	13,191.10
Repairs .....	554.46
Maintenance and operation.....	3,112.01
Equipment .....	25.90
Total .....	\$25,763.47

MAINTENANCE NAVIGATION ILLINOIS RIVERS EXPENDITURES, JULY 1, 1927, TO JUNE 30, 1928.

Salary locktenders, collectors and inspectors.....	\$ 5,650.00
Labor payrolls .....	5,075.23
Repairs .....	24,519.26
Piling and repairs at dam on Fox River.....	4,803.55
Maintenance and operation.....	2,640.80
Dredging at Spring Bay.....	2,857.92
Equipment .....	53.72
Total expenditures .....	\$45,600.48

NUMBER OF BOATS RUNNING. TOLLS AND LOCKAGE COLLECTED, AND TONS TRANSPORTED ON THE ILLINOIS AND MICHIGAN CANAL AND THROUGH HENRY AND COPPERAS CREEK LOCKS FOR PERIOD JULY 1, 1927, TO JUNE 30, 1928.

	Copperas Creek.	Henry.	Joliet.	LaSalle.	Channahon.	Total.
Tolls and lockages.....		\$ 83 68	\$126 00	\$29 45	\$1 89	\$ 241 02
Boats cleared.....		26 00	34 00	7 00	3 00	70 00
Tons transported.....		4,509 00				4,509 00

STATEMENT OF THE PRINCIPAL ARTICLES TRANSPORTED UPON THE ILLINOIS RIVER, CLEARED AT COLLECTOR'S OFFICE AT LOCKS, AT HENRY AND COPPERAS CREEK, FOR THE YEAR ENDING JUNE 30, 1928.

Articles.	Measure.	Copperas Creek.	Henry.	Total.
Corn.....	Bushel.....		45,000	45,000
Wheat.....	Bushel.....		16,000	16,000
Oats.....	Bushel.....		12,500	12,500



## ACTIVITY REPORT.

Receipts increased over previous year \$608.94 and expenditures decreased \$13,399.49, decrease in expenditures due to there being no serious flood damage to the canal banks during the past year.

The balance on hand June 30, 1928, is \$10,633.98 more than on hand June 30, 1927, and \$51,599.37 more than was on hand July 1, 1917, when the Division of Waterways assumed charge of the Illinois and Michigan Canal.

There was a small increase in tolls and boats using the canal. Due to high water in the Illinois River all boats on the river passed over the dam instead of using the lock at Copperas Creek.

Seventeen new leases for strips of canal reserve were made, nine certified copies of land and lot sale records furnished and one level license issued, three leases expired and buildings were removed from canal land.

Abandoned watchman house near Brandon Bridge was taken down and removed.

Quit claim deed issued for vacated street in Joliet.

Permits issued to: City of LaSalle to use land near Lock 14 to widen approach to bridge; Public Service Company for two transmission lines across canal; Illinois Bell Telephone Company to change location of poles at Crawford Avenue and at Joliet, and to the Santa Fe and Pennsylvania Railroads to reinforce their bridges.

## AQUEDUCT AND CULVERT BUILT.

New steel aqueduct over Aux Sable River was constructed and during construction period a flume was installed to keep the canal supplied with water.

New concrete culvert across canal at Gum Creek was built.

South wall of Lock 13 has been repaired and strengthened, minor repairs made to all locktender houses, rebuilt towpath bridge at Aux Sable and installed new waste gates, two new lock gates constructed and are ready to be installed at Lock 9.

The United States dredging outfit removed fill at mouth of the canal west of LaSalle and in the Illinois River at Spring Bay.

The canal was unwatered for four days, between Morris and Marshalls while village of Seneca were installing water main under the canal.

A temporary lift railroad bridge has been built across canal east of Brandon bridge.

## HIGH WATER DAMAGES CANAL BANKS.

High water in Illinois River badly damaged by wave wash the banks east of LaSalle, same has been repaired and for a distance of 4,200 feet the bank was raised to grade and widened using coal mine culm from a waste pile alongside the canal.

The interior and exterior of steel aqueduct over the Little Vermilion River was sand-blasted and painted with two coats of asphalt paint.

State dredge outfit removed sand bar 1,130 feet long at Higby, and built up, repaired banks and deepened channel, near Locks 12, 13, 14 and 15, at Blackball, west of LaSalle Street, Ottawa, Seneca and Car-

son Creek. It is the intent to continue raising canal banks and deepening the channel between Channahon and Brandon bridge until navigation closes.

Thirty-one test plates of steel and paints have been immersed in the canal at Jackson Street Lock for testing purposes.

#### FEDERAL GOVERNMENT TAKES OVER STATE DAMS.

The Federal government takes over the property of the State at Henry and Copperas Creek Locks on July 1, 1928. Notices have been served on all who have leases with the State at these two locks, that their leases are to be cancelled on August 6, 1928, and notices sent to the two collectors and locktenders that their services would terminate June 30, 1928.

Navigation on the canal opened July 17, 1927, and closed on December 8, 1927, and was opened the present season on June 4, 1928, for boats with draft of not exceeding three feet six inches.

Canal structures, banks and the channel are in better condition than at any time during the past few years.

#### PUBLICATIONS FOR DISTRIBUTION BY THE DIVISION OF WATERWAYS.

*Issued by the Rivers and Lakes Commission of Illinois 1911-1916.*

\* \* \*

#### BULLETINS.

No. 1. The Conservation of Water Power in the DesPlaines and Illinois Rivers and the Improvement of these Rivers for Navigation—1911.

No. 2. Prospectus of a project for a Deep Waterway and conservation of a natural resources of the State of Illinois, prepared by Lyman E. Cooley—1911.

No. 3. Uses of the Great Lakes—1912.

No. 4.\* Land Drainage in Illinois, by Robert Isham Randolph—1913.

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No. 6. Argument on behalf of the State of Illinois supporting the prayer of the Sanitary District of Chicago for a permit to take 10,000 cubic feet of water per second from Lake Michigan, by Isham Randolph—1912.

No. 7.\* The 1912 Flood on the Lower Mississippi, by A. L. Dabney, Consulting Engineer, and "The 1912 Flood in the Ohio and Mississippi Rivers," by H. C. Frankenfeld—1912.

No. 8. Proceedings of the organization meeting of the Association of the Mississippi Valley States for river control—1912.

No. 9. The Illinois Water Power Waterway—1912.

No. 10. The Illinois Waterway—A Guide for Navigators from Lake Michigan to the Mississippi River via the Chicago Sanitary and Ship Canal, the Illinois and Michigan Canal and the Illinois River. Also an Alternate Route via the Illinois and Mississippi Canal—1928.

No. 11.\* European Harbor Development, by Robert R. McCormick—1912.

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No. 13. The Illinois Waterway, A Review, by Isham Randolph—1912.

No. 14. Water Resources of Illinois—A cooperative report prepared by Rivers and Lakes Commission and A. H. Horton, District Engineer, of the United States Geological Survey—1914.



No. 15.\* The Illinois Waterway—A Project for a waterway of eight feet minimum depth between Lockport and Utica and available for immediate construction—1914.

No. 16. Stream Pollution and Sewage Disposal in Illinois with reference to Public Policy and Legislation, by LeRoy K. Sherman—1915.

No. 17.\* Report of Survey and Investigation of LaMoine River, with reference to Flood Control and Navigation.

No. 18.\* Flood Control for Pecatonia River—1916.

No. 19.\* Projects for a Navigable Waterway from Southern Illinois Coal Fields to Mississippi River—1917.

No. 20.\* The Illinois Waterway Report with plans and estimates of cost for a deep waterway from Lockport to Utica by way of the DesPlaines and Illinois Rivers, Internal Improvement Commission—1909.

No. 21.\* Surface Water Supply of Illinois, Internal Improvement Commission—1908—1910.

No. 22. Report and (Plans\*) for reclamation of lands subject to overflow in the Kaskaskia River Valley, Illinois—1910—1911. Postage 16 cents.

No. 23. Report from the prevention of overflow of the Little Wabash and Skillet Fork Rivers—1911. Postage 16 cents.

No. 24. The Illinois River and its Bottom Lands, by Alvord and Burdick—1915. 2nd Edition 1919.

\*Map and Profile of Fox River—1915.

Annual reports of Rivers and Lakes Commission 1912\*—1913—1914—1915\*—1916.\*

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\*First annual report—1917-18.

\*First Annual Report—1917-18.

Second, Third, Fourth, Fifth, Sixth, Seventh, Eighth, Ninth and Tenth Annual Reports 1918-27, inclusive.

Saline River report 1920 (See Third Annual Report).

Inland Waterways and Transportation Cost by M. G. Barnes, 1920.

No. 25. Big Muddy River Report, 1922—(Also in Fifth Annual Report).

No. 25½. Floods in Illinois, 1922—causes, results and remedies. (Also in Fifth Annual Report).

Pecatonia River Report—1924. (See Seventh Annual Report).

Report of the Interstate Harbor Commission of Illinois and Indiana on Harbor and Terminal Development at the State line between Illinois and Indiana and in Chicago Industrial District—1922.

No. 26. Calumet Lake and Chicago-Nickle Plate Agreement—1926.

No. 27. Laws of Illinois relating to Waterways—1926.

No. 28. National Aspect of Lakes to Gulf Waterway — Diversion of Waters from Lake Michigan—Boundary Waters Treaty, etc.—1926.

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\* On file in office of Division of Waterways, Chicago. Supply for distribution exhausted.

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